Compliance Testing, LLC
Previously Flom Test Lab
EMI, EMC, RF Testing Experts Since 1963
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Test Report

Prepared for: BK Technologies, Inc

Model: BKR9000

Description: Multi-Band Portable Radio VHF/UHF/800/900

FCC ID: K95BKR9000
ISED ID: 2116A-BKR9000

To

FCC_ Part 90
ISED_RSS-119 issue 12

Date of Issue: April 23, 2019

On the behalf of the applicant:	**BK Technologies, Inc** **7100 Technology Drive ,** **7505 Technology Dr7505 Technology Dr** **Melbourne, FL 3290432904**
Attention of:	**Jim Holthaus, Chief Technology Officer** **Ph: (402)896-6406** **E-Mail:** **JHolthaus@BKTechnologies.comJHolthaus@BKTechnologies.com**

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Project No: p18a0023

Greg Corbin
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	June 20, 2019	Greg Corbin	Original Document
2.0	August 4, 2019	Greg Corbin	Removed hyphen from model number on page 1. Corrected frequency on page 7 from 406 MHz to 406.1 MHz. Removed 16K0F3E from page 7 for 136 – 174 MHz and 378 – 522 MHz Updated OCC BW plot for 939.075 MHz FM NB in Annex C Added Modular information to page 6

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ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

Testing Certificate Number: **2152.01**

FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II, Part 2, Subpart J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, ANSI C63.26-2015, FCC Part 90, RSS-119 and RSS-GEN.

Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing.

In accordance with ANSI/TIA 603C, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Environmental Conditions		
Temp (ºC)	Humidity (%)	Pressure (mbar)
18.0 – 26.4	22.7 – 48.0	959.2 – 974.6

Measurement results, unless otherwise noted, are worst-case measurements.

EUT Description

Model: BKR-9000
Description: Multi-Band Portable Radio VHF/UHF/800/900
Firmware: 6.5.5.0
Software: 5.6.26
DSP: 0.5.1
Serial Number: FCC VHF #14, FCC UHF #21, FCC 800/900 #4

Additional Information:

The EUT is a portable land mobile radio operating in the VHF, UHF, 800/900 MHz bands as noted in Table 1.
The EUT was tested with 3 separate BKR9000 radios programmed to the individual frequency bands for VHF, UHF, 700/800/900 MHz operation.

The EUT contains the following pre-certified modules.
The installed LTE module is non-operational and will be added to the radio at a later date.

Manufacturer	Module	FCC ID	ISED ID
Texas Instruments	WiFi-BT Module WL1837MODGIMOCT	Z64-WL18DBMOD	4511-WL18DBMOD
NXP	NFC Controller PN7120	VPQ-PN7120	7329A-PN7120
Telit	LTE Modem LE910C1 NS	RI7LE910C1NS	5131A-LE910C1NS

EUT Operation during Tests
The EUT is battery powered with the nominal voltage set to 7.2 vdc.
The output power was set to maximum for all tests.
The test frequencies are listed in Table 2 and identified as to whether the frequency is FCC/IC only or common to FCC and IC.
The radio is an all digital design and there is no analog audio input. For those tests that require a modulated signal, analog or digital, the manufacturer provided internal analog and digital test signals as well as a CW test signal.
For tests requiring modulated signals, the following internal test signals were used:
For NB, used 2.5 kHz rep rate at 1.5 kHz deviation
For WB, used 2.5 kHz rep rate at 3 kHz deviation
For Digital, used TX Standard Pattern (C4FM)
For audio tests additional signals were provided by the manufacturer.

Table 1 – Frequency Range, Modulation Type and Emission Designators

Frequency Range (MHz)		Modulation and Emission Designators			
FCC	IC	FM_12.5kHz	FM_25 kHz	P25 Phase1 C4FM	P25 Phase 2 TDMA
136 – 174	138 - 174	11K0F3E	N/A	8K10F1E / 8K10F1D	8K10F1W
378 - 522	406.1 – 430, 450 - 470	11K0F3E	N/A	8K10F1E / 8K10F1D	8K10F1W
806 - 824	806 - 824	11K0F3E	16K0F3E	8K10F1E / 8K10F1D	8K10F1W
851 - 869	851 - 869	11K0F3E	16K0F3E	8K10F1E / 8K10F1D	8K10F1W
896 - 901	896 - 901	11K0F3E	16K0F3E	8K10F1E / 8K10F1D	8K10F1W
935 - 940	935 - 940	11K0F3E	16K0F3E	8K10F1E / 8K10F1D	8K10F1W

Table 2 –Test Frequencies

Test Frequencies (MHz)	FCC / IC Frequency
138.025	FCC, IC
150.075	FCC, IC
162	FCC, IC
173.975	FCC, IC
378.025	FCC extended frequency
406.2	FCC, IC
420	FCC, IC
429.975	FCC, IC
450.025	FCC, IC
461	FCC, IC
469.1	FCC, IC
511.975	FCC
806.025	FCC, IC
815	FCC, IC
823.975	FCC, IC
851.025	FCC, IC
860	FCC, IC
868.975	FCC, IC
896.025	FCC, IC
900.075	FCC, IC
935.025	FCC, IC
939.075	FCC, IC

Accessories:

Qty	Description	Manufacturer	Model	S/N
1	Battery, Li-ion Rechargeable	BK	4005-31131-600	N/A
1	Battery Charger	BK	7011-31131-400	N/A
1	Battery Eliminator	BK	N/A	N/A
1	Antenna	BK	VHF UHF 700 - 900	N/A

Cables: None

Modifications: None

Test Result Summary

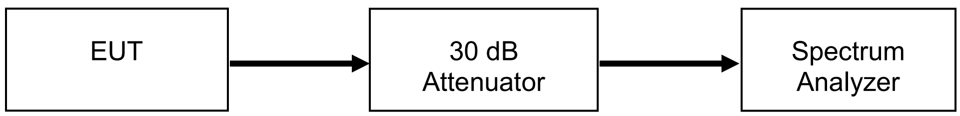
Specification		Test Name	Pass, Fail, N/A	Comments
FCC	ISED			
90.205 2.1046	RSS-119_5.4	Carrier Output Power (Conducted)	Pass	
90.210 2.1051	RSS-119_5.8.9.2	Unwanted Emissions (Transmitter Conducted)	Pass	
90.210 2.1053	RSS-119_5.8.9.2	Field Strength of Spurious Radiation	Pass	
90.210, 2.1049	RSS-119_5.5	Emission Masks (Occupied Bandwidth)	Pass	
2.1047	N/A	Audio Low Pass Filter (Voice Input)	Pass	
2.1047	N/A	Audio Frequency Response	Pass	
2.1047(a)	N/A	Modulation Limiting	Pass	
90.213	RSS-119_5.3	Frequency Stability (Temperature Variation)	Pass	
90.213	RSS-119_5.3	Frequency Stability (Voltage Variation)	Pass	
90.214	RSS-119_5.9	Transient Frequency Behavior	Pass	
2.202	N/A	Necessary Bandwidth Calculation	Pass	

Carrier Output Power (Conducted)
Engineer: Greg Corbin
Test Date:2/18/2019

Measurement Procedure

The Equipment Under Test (EUT) was connected to a spectrum analyzer through a 30 dB Power attenuator. All cable and attenuator losses were input into the spectrum analyzer as a reference level offset to ensure accurate readings were obtained.

Test Setup



Transmitter Peak Output Power

Tuned Frequency	Output Power	Output Power	Result
MHz	(dBm)	(watts)	
138.025	38.29	6.745	Pass
150.075	38.15	6.531	Pass
162	38.01	6.324	Pass
173.975	37.79	6.012	Pass
378.025	37.02	5.035	Pass
406.2	37.38	5.47	Pass
420	37.54	5.675	Pass
429.975	37.41	5.508	Pass
450.025	37.36	5.445	Pass
461	37.4	5.495	Pass
469.1	37.21	5.26	Pass
511.975	37.05	5.07	Pass
806.025	34.6	2.884	Pass
815	34.67	2.931	Pass
823.975	34.61	2.891	Pass
851.025	34.68	2.938	Pass
860	34.57	2.864	Pass
868.975	34.56	2.858	Pass
896.025	34.33	2.71	Pass
900.075	34.32	2.704	Pass
935.025	34.43	2.712	Pass
939.075	34.43	2.712	Pass

Conducted Spurious Emissions

Engineer: Greg Corbin

Test Date: 6/18/2019

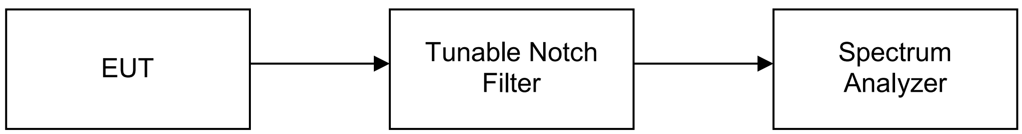
Test Procedure

The EUT was connected directly to a spectrum analyzer to verify that the EUT met the requirements for spurious emissions. A tunable notch filter was utilized to ensure the fundamental did not put the spectrum analyzer into compression. The resolution bandwidth set for 100 kHz or 1 MHz as required per the rule section and the reference level was adjusted to ensure the system had sufficient dynamic range to measure spurious emissions.

The frequency range from 30 MHz to the 10^{th} harmonic of the fundamental transmitter was observed and plotted.

The specification limit was set for -20 dBm for comparison to the emission mask "D" limit which is the more stringent limit, except for the 900 MHz band which utilizes Mask I and has a -13 dBm limit.

Test Setup



Conducted Spurious Emissions Summary Test Table

Tuned Frequency (MHz)	Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Specification Limit (dBm)	Result
138.025	414.132	-24.7	-20	Pass
150.075	450.257	-26.5	-20	Pass
162	486.007	-26.0	-20	Pass
173.975	521.881	-25.7	-20	Pass
378.025	1134	-28.4	-20	Pass
406.2	1219	-28.6	-20	Pass
420	1260	-27.7	-20	Pass
429.975	1290	-28.2	-20	Pass
450.025	1350	-27.4	-20	Pass
461	1382.9	-27.3	-20	Pass
469.1	1382.9	-27.3	-20	Pass
511.975	1535.9	-28.5	-20	Pass
806.025	6992.5	-26.0	-20	Pass
815	7420.1	-26.2	-20	Pass
823.975	7222	-26.0	-20	Pass
851.025	7179.3	-25.7	-20	Pass
860	7642.8	-25.6	-20	Pass
868.975	7485.3	-25.1	-20	Pass
896.025	7060	-25.5	-13	Pass
900.075	7915.1	-26.3	-13	Pass
935.025	7308.7	-25.6	-13	Pass
939.075	7504.4	-26.1	-13	Pass

Annex A Conducted Spurious Emission

Refer to Annex A for Conducted Spurious Emission plots

Field Strength of Spurious Radiation
Engineer: Greg Corbin
Test Date: 6/192019

Test Procedure

The EUT was tested in a semi-anechoic chamber with the turntable set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360 degrees with the antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure that the signal levels were maximized. All cable and antenna correction factors were input into the spectrum analyzer ensuring an accurate measurement in ERP/EIRP with the resultant power in dBm.

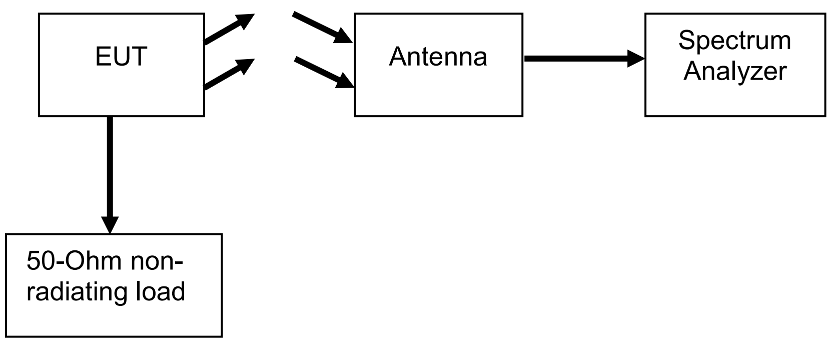
The EUT was set to transmit at maximum power with the RF output terminated with 50 ohms.

The RBW was set to 100 kHz for measurements below 1 GHz and 1 MHz for measurements above 1 GHz.
The VBW was set to 3 times the RBW.

The following formula was used for calculating the limits:

For the VHF, UHF, 800 MHz band the radiated spurious limit = P1 – (50+ 10Log(P2)) = -20dBm
900 MHz band the radiated spurious limit = P1 – (43+ 10Log(P2)) = -13dBm

Test Setup



Radiated Spurious Emissions Summary Test Table

Tuned Frequency (MHz)	Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Specification Limit (dBm)	Result
138.025	1656.1	-22.7	-20	Pass
150.075	1801.3	-22.1	-20	Pass
162	1944.9	-33.5	-20	Pass
173.975	522.0	-45.3	-20	Pass
378.025	3780	-33.7	-20	Pass
406.2	4065	-31.6	-20	Pass
420	1684	-32.7	-20	Pass
429.975	3870	33.5	-20	Pass
450.025	4050	-30.6	-20	Pass
461	1849	-35.6	-20	Pass
469.1	3757	-32.2	-20	Pass
511.975	3584	-33.1	-20	Pass
806.025	4030	-27.3	-20	Pass
815	4075	-24.9	-20	Pass
823.975	4120	-24.4	-20	Pass
851.025	4255	-25.6	-20	Pass
860	4300	-25.8	-20	Pass
868.975	4345	-24.6	-20	Pass
896.025	4480	-22.7	-13	Pass
900.075	4503	-23.3	-13	Pass
935.025	2805	-17.0	-13	Pass
939.075	2819	-15.3	-13	Pass

Annex B Radiated Spurious Emission

Refer to Annex B for Radiated Spurious Emission plots

Emission Masks (Occupied Bandwidth)

Engineer: Greg Corbin

Test Date: 2/26/2019

Measurement Procedure

The EUT was connected directly to a spectrum analyzer to verify that the EUT meets the required emissions mask. A reference level plot is provided to verify that the peak power was established prior to testing the mask. The EUT does not have an analog audio input. The manufacturer provided internal test signals for emission mask and occupied bandwidth tests.

For narrowband FM, the internally generated signal was set to 2.5 kHz repetition rate at 1.5 kHz deviation.

For wideband FM, the internally generated signal was set to 2.5 kHz repetition rate at 1.5 kHz deviation.

For digital modulation, the internally generated signal was set to C4FM.

Test Setup

Annex C Occupied Bandwidth

Refer to Annex C for Occupied Bandwidth plots.

Annex D Emission Mask

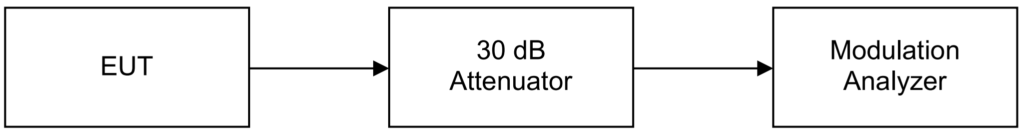
Refer to Annex D for Emission Mask plots.

Transient Frequency Behavior
Engineer: Greg Corbin
Test Date: 3/19/2019

Measurement Procedure

The EUT was connected directly to a modulation analyzer through a 40 dB attenuator to verify that the EUT meets the required Transient Frequency Behavior response per the specification. The modulation analyzer is a real time spectrum analyzer with integrated demodulation, audio measurement capabilities, and timing analysis.
The turn on and turn off transient timing was measured and recorded.

Test Setup



Annex E Transient Frequency Behaviour

Refer to Annex E for Transient Frequency Behaviour plots.

Audio Low Pass Filter (Voice Input)

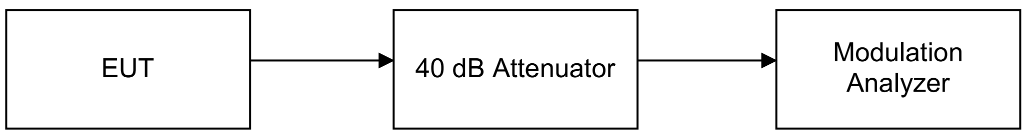
Engineer: Greg Corbin

Test Date: 3/18/2019

Measurement Procedure

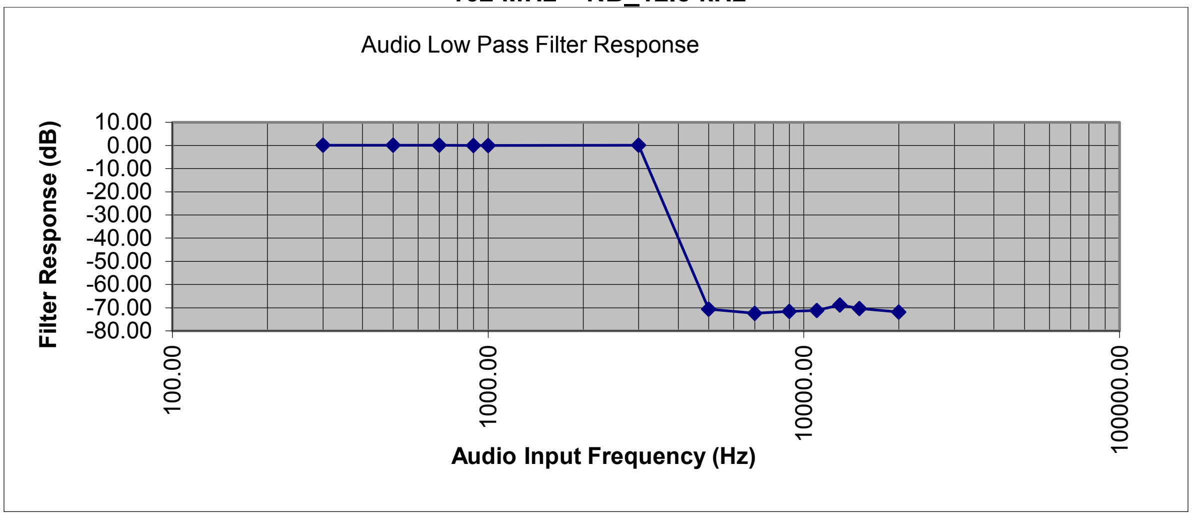
The EUT was connected directly to a modulation analyzer through an attenuator.
The EUT does not have any analog audio inputs to inject an external audio signal..
The manufacturer provided internal test signals with the proper modulations for the audio testing.
The modulation analyzer is a real time spectrum analyzer with integrated demodulation, audio measurement capabilities, and timing analysis.

Test Setup

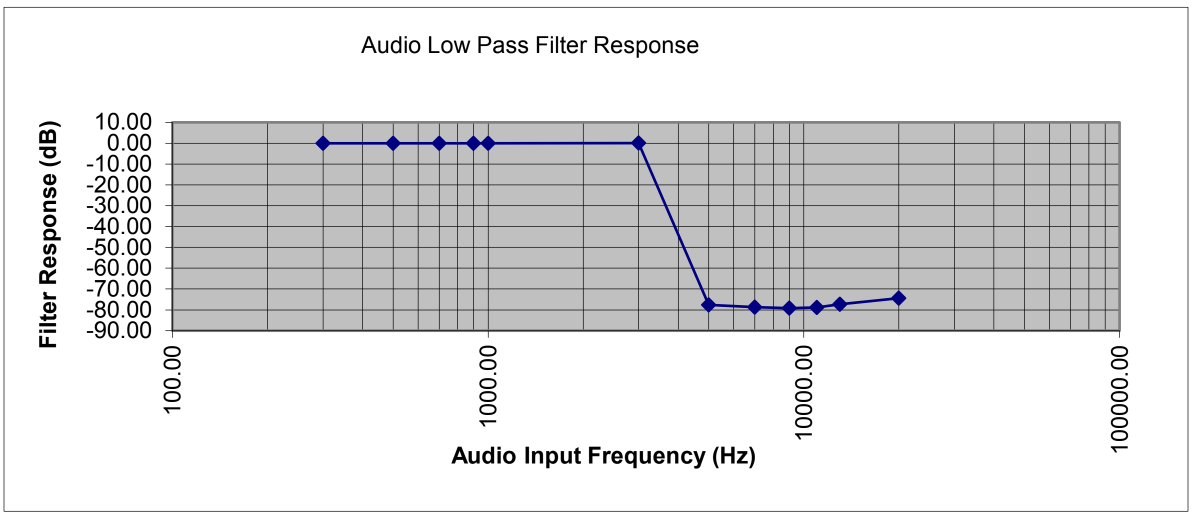


Audio Low Pass Filter Test Results

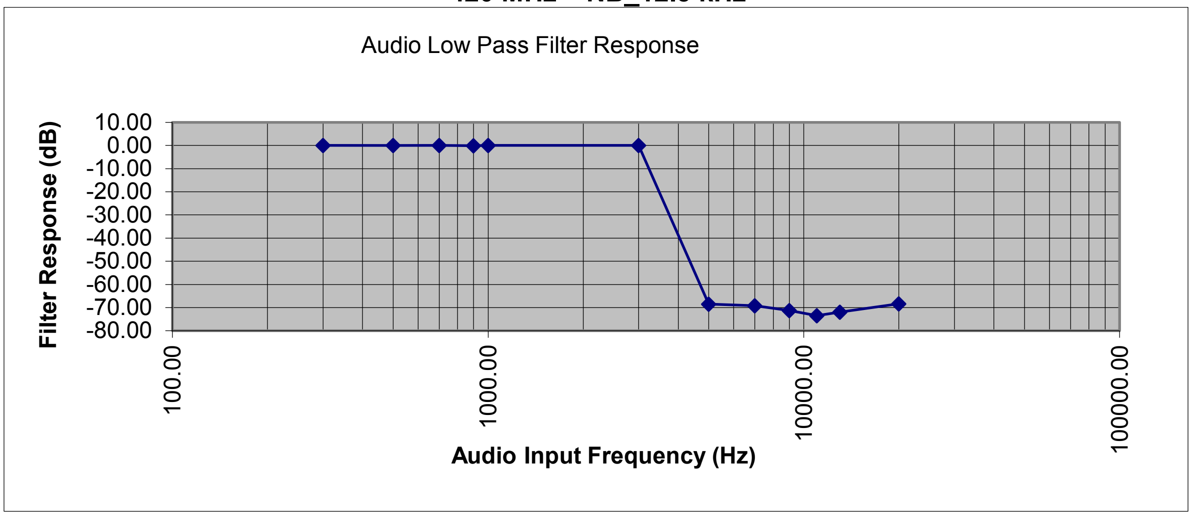
162 MHz – NB_12.5 kHz



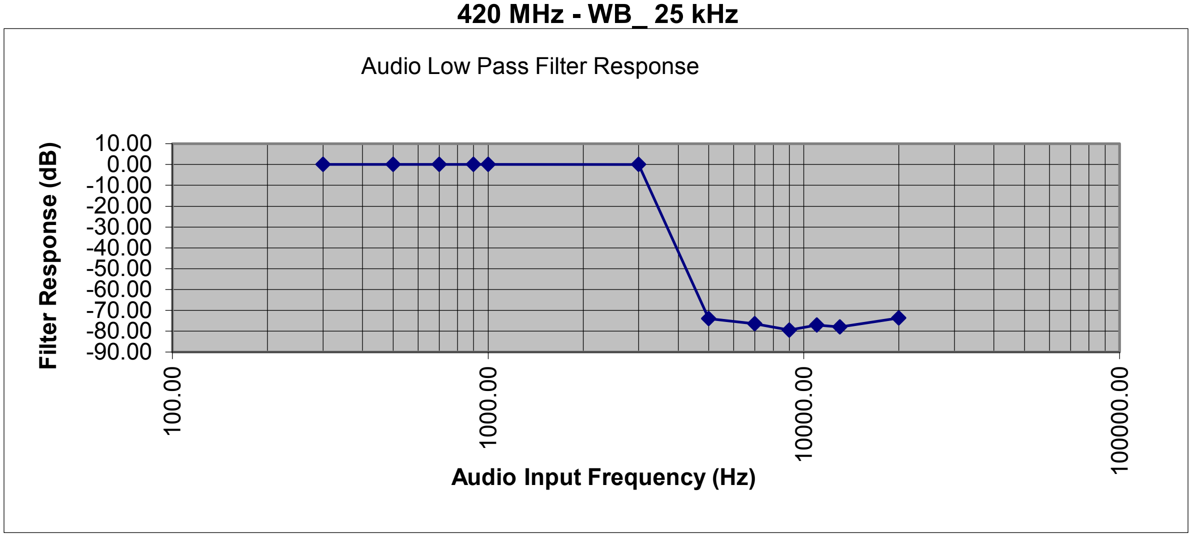
162 MHz - WB_ 25 kHz



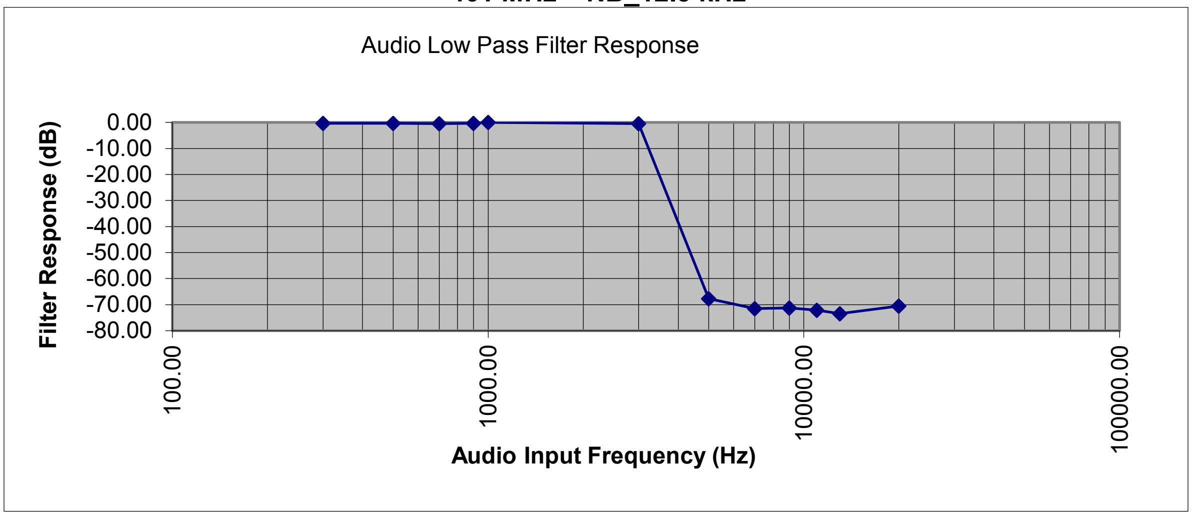
420 MHz – NB_12.5 kHz



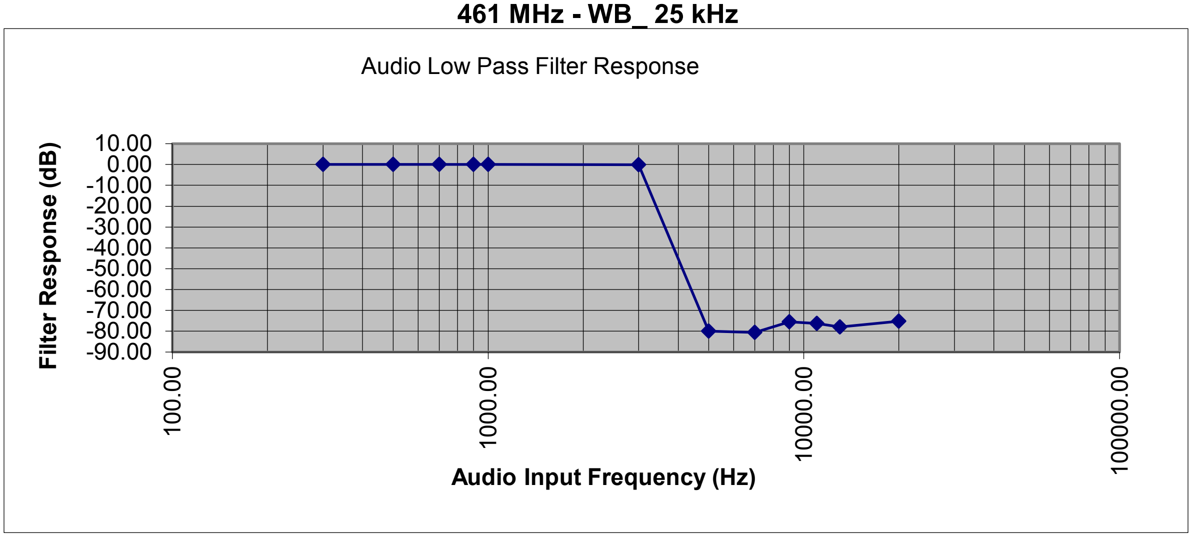
420 MHz - WB_ 25 kHz



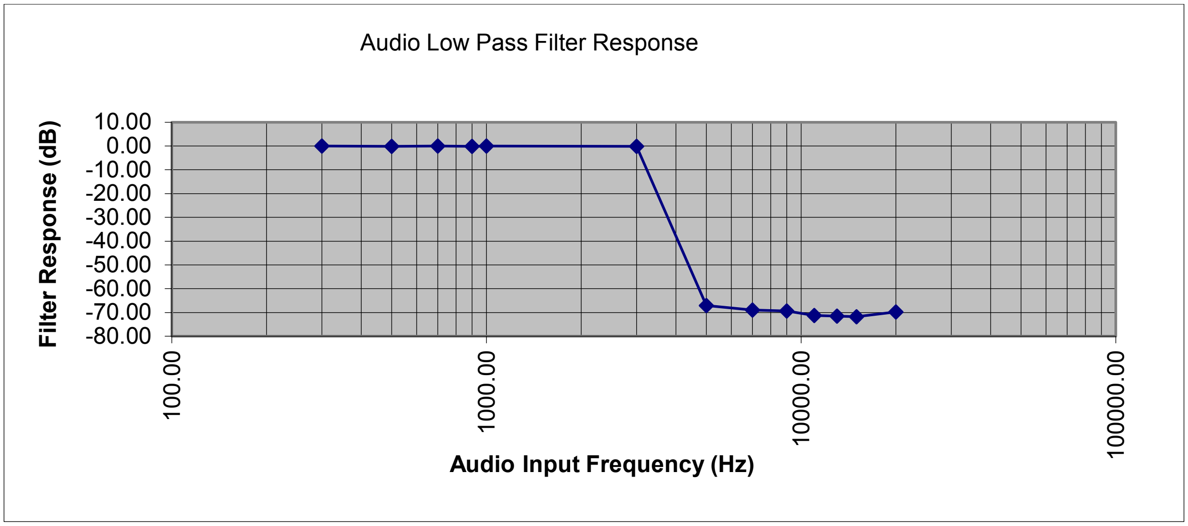
461 MHz – NB_12.5 kHz



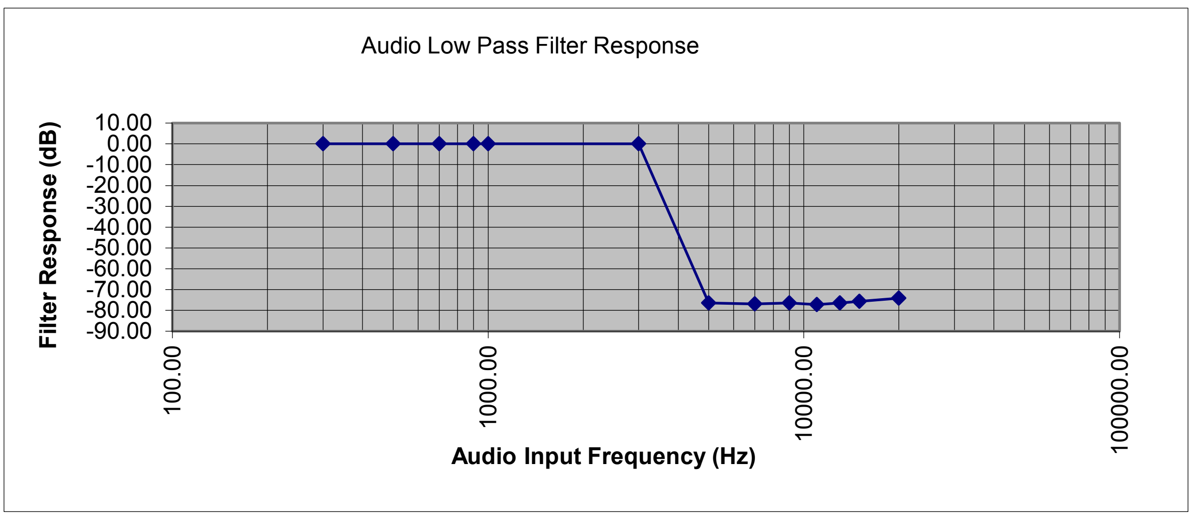
461 MHz - WB_ 25 kHz



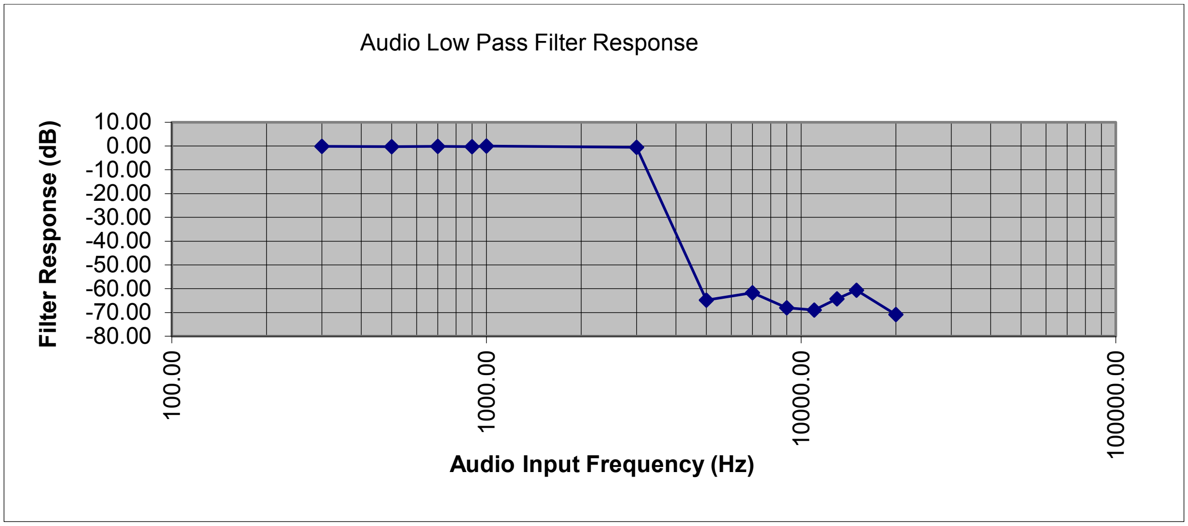
815 MHz – NB_12.5 kHz



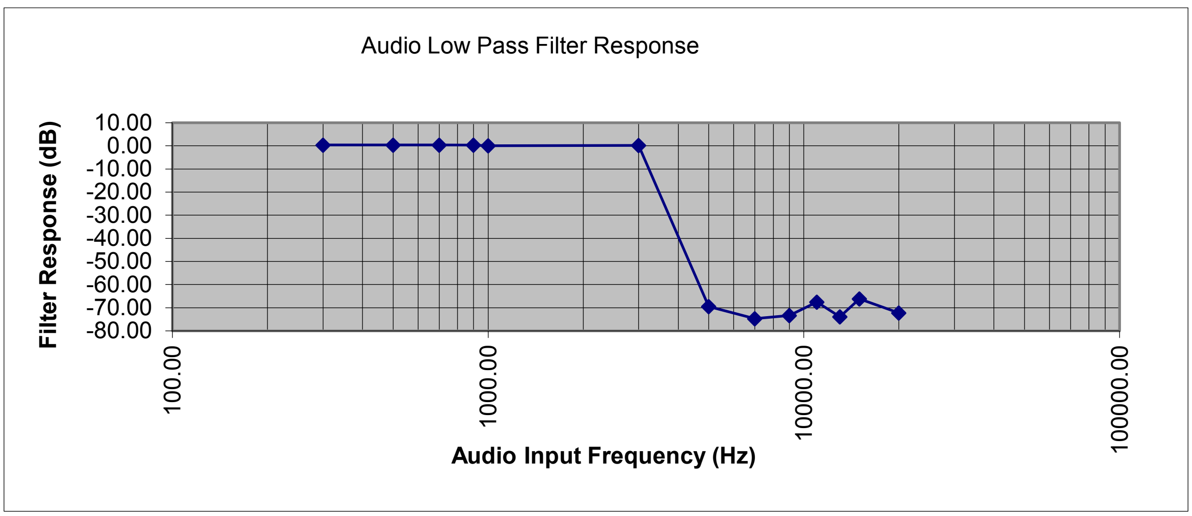
815 MHz - WB_ 25 kHz



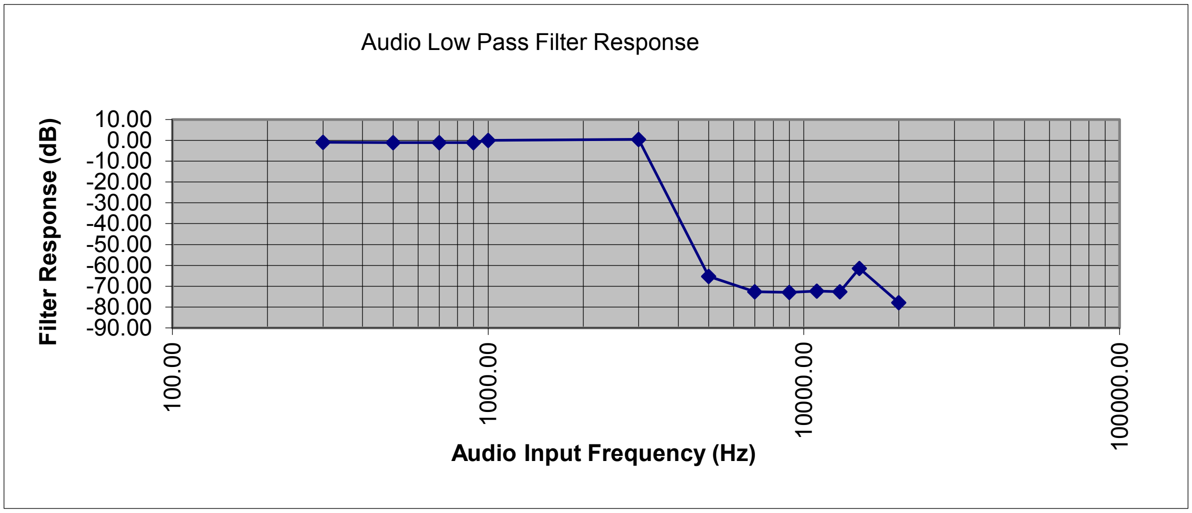
860 MHz – NB_12.5 kHz



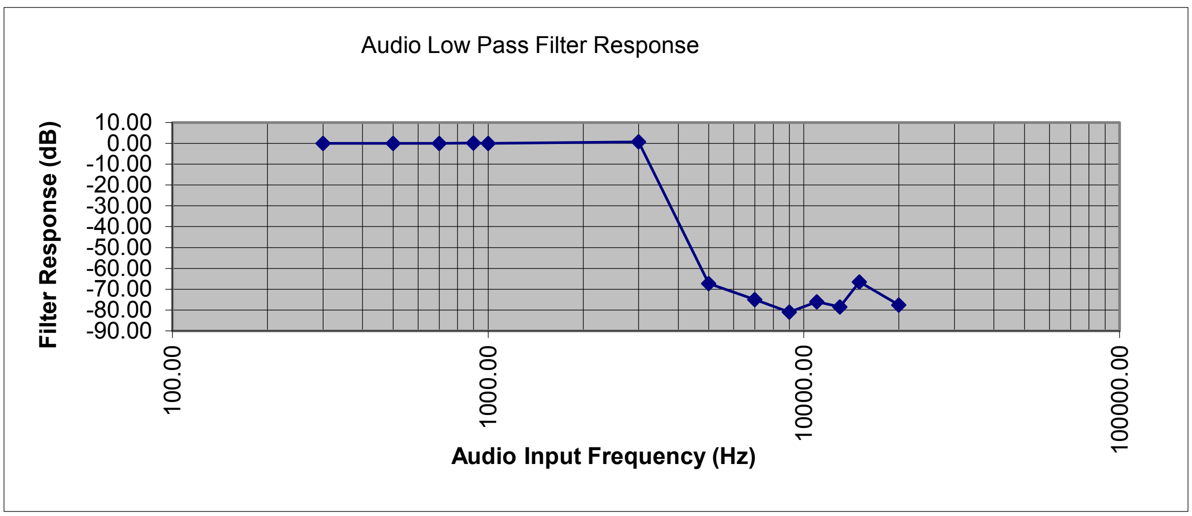
860 MHz - WB_ 25 kHz



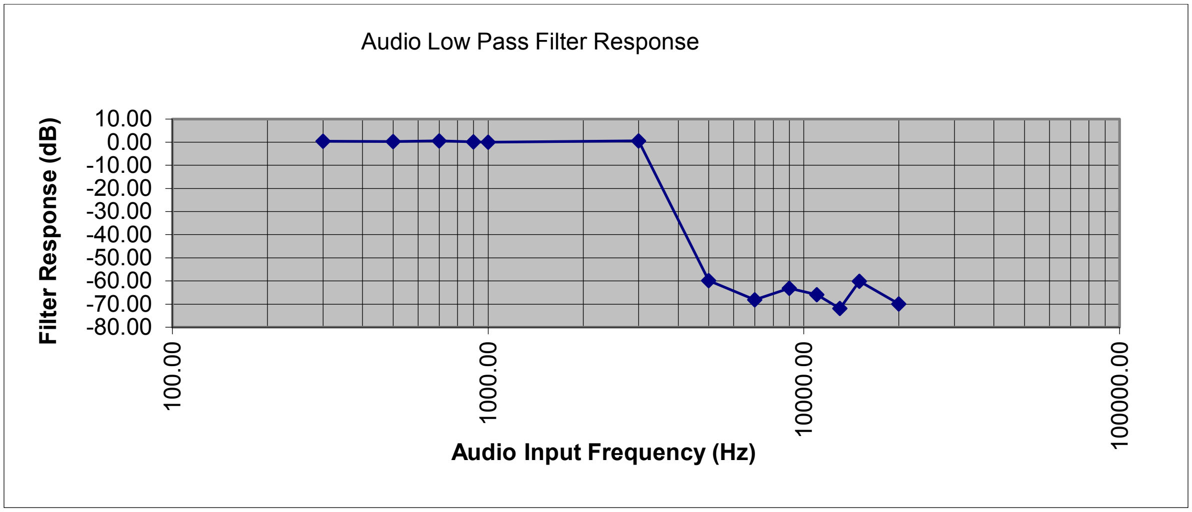
900.075 MHz – NB_12.5 kHz



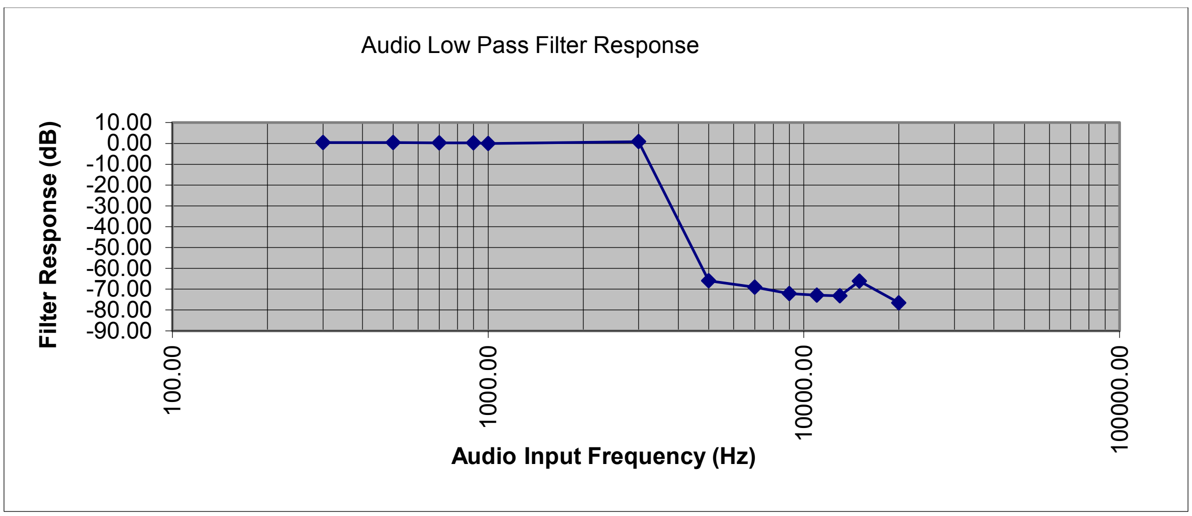
900.075 MHz - WB_ 25 kHz



939.075 MHz – NB_12.5 kHz



939.075 MHz - WB_ 25 kHz



Audio Frequency Response

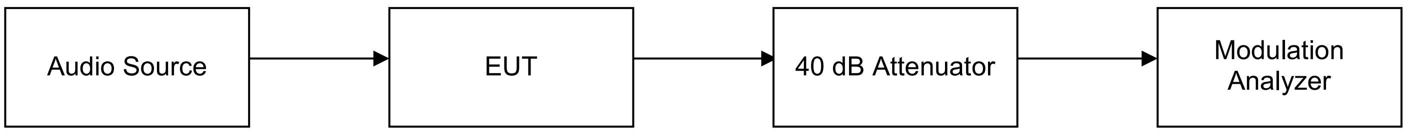
Engineer: Greg Corbin

Test Date: 3/18/2019

Measurement Procedure

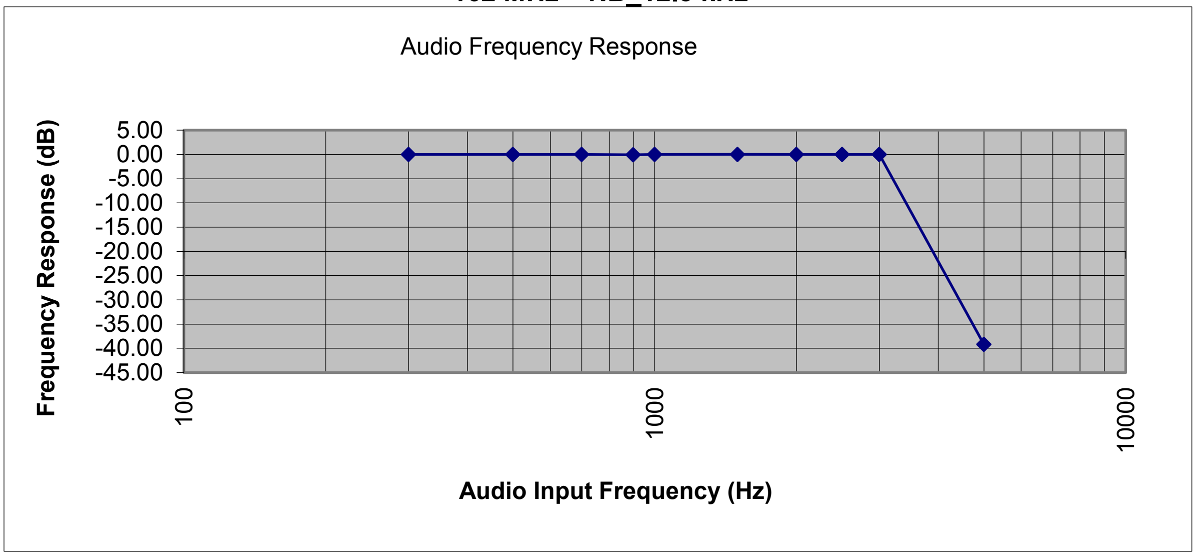
The EUT was connected directly to a modulation analyzer through an attenuator. The audio source was tuned across the required audio frequency range and the audio frequency response was measured and plotted. The modulation analyzer is a real time spectrum analyzer with integrated demodulation, audio measurement capabilities, and timing analysis.

Test Setup

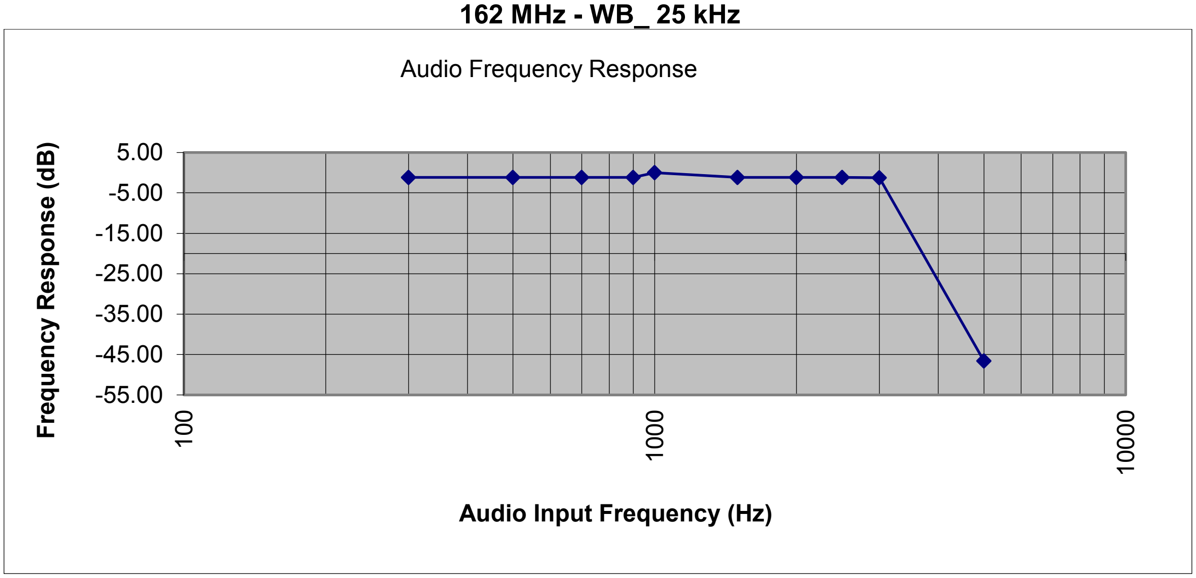


Audio Frequency Response Test Results

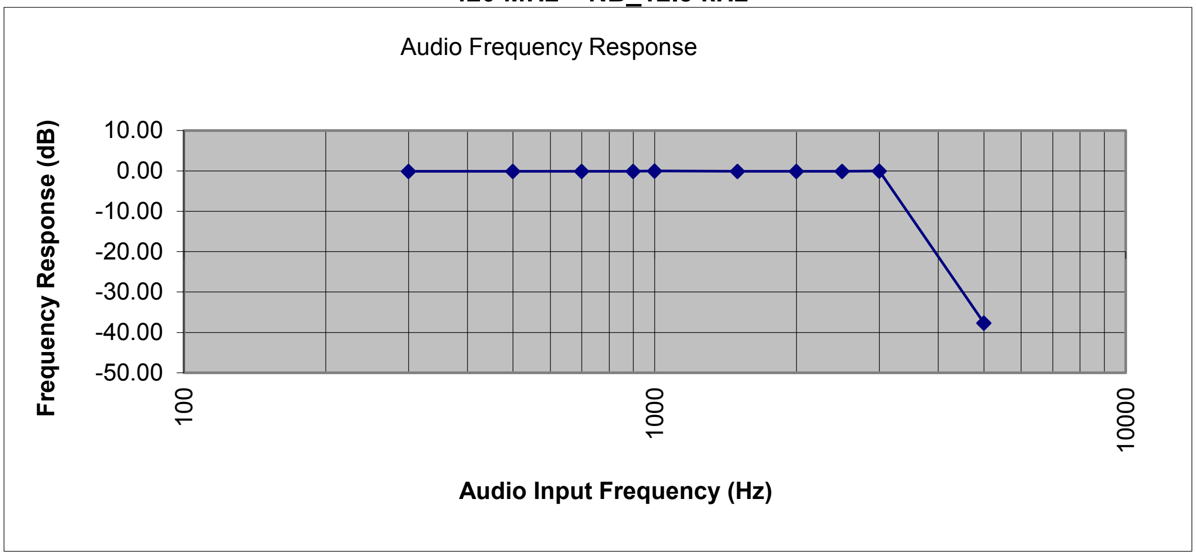
162 MHz – NB_12.5 kHz



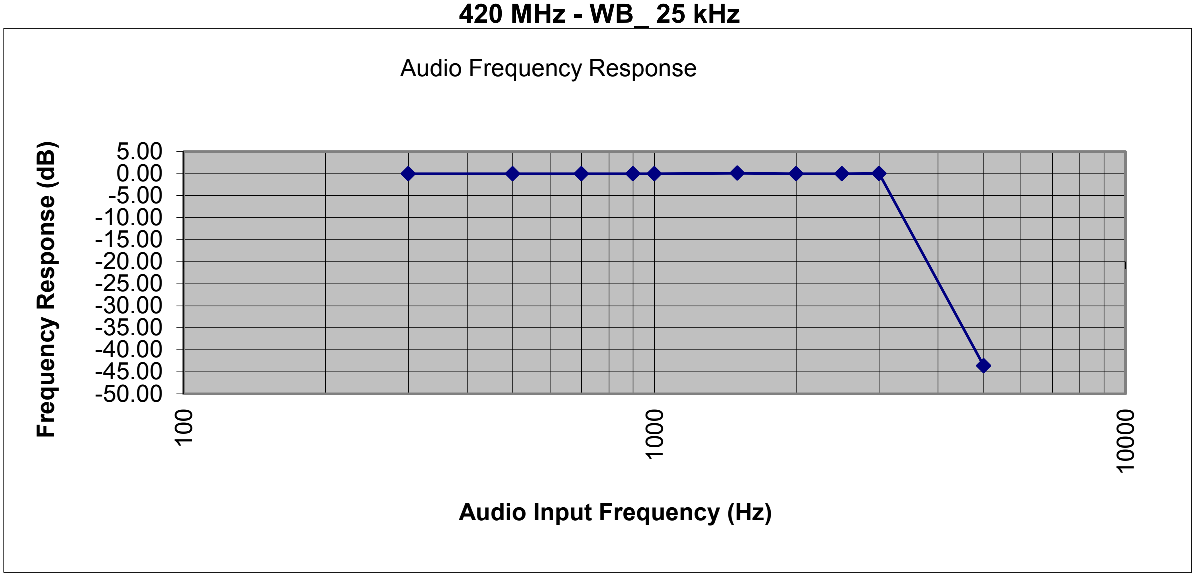
162 MHz - WB_ 25 kHz



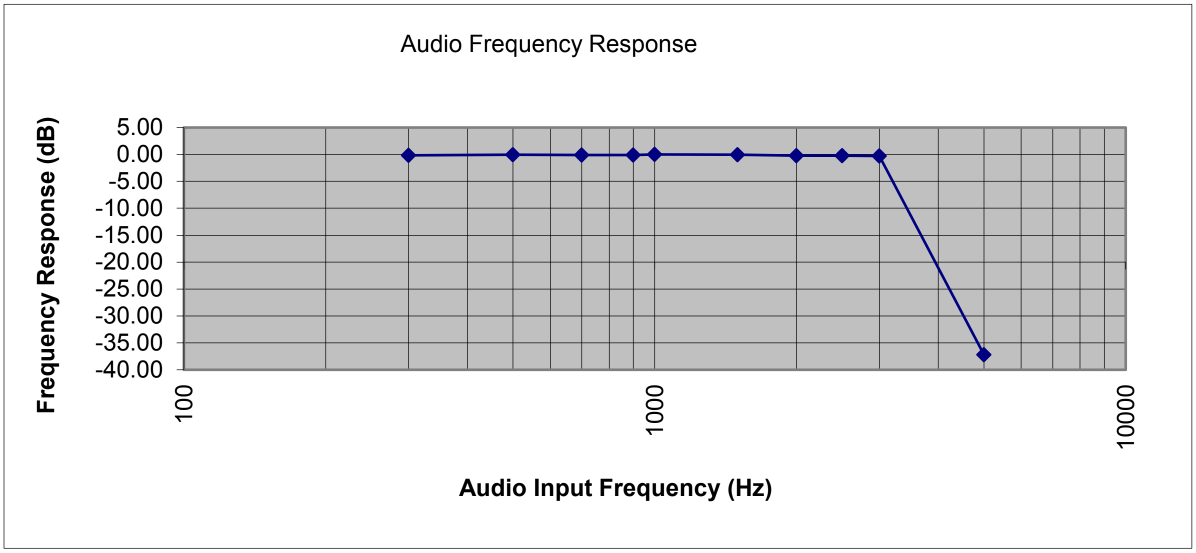
420 MHz – NB_12.5 kHz



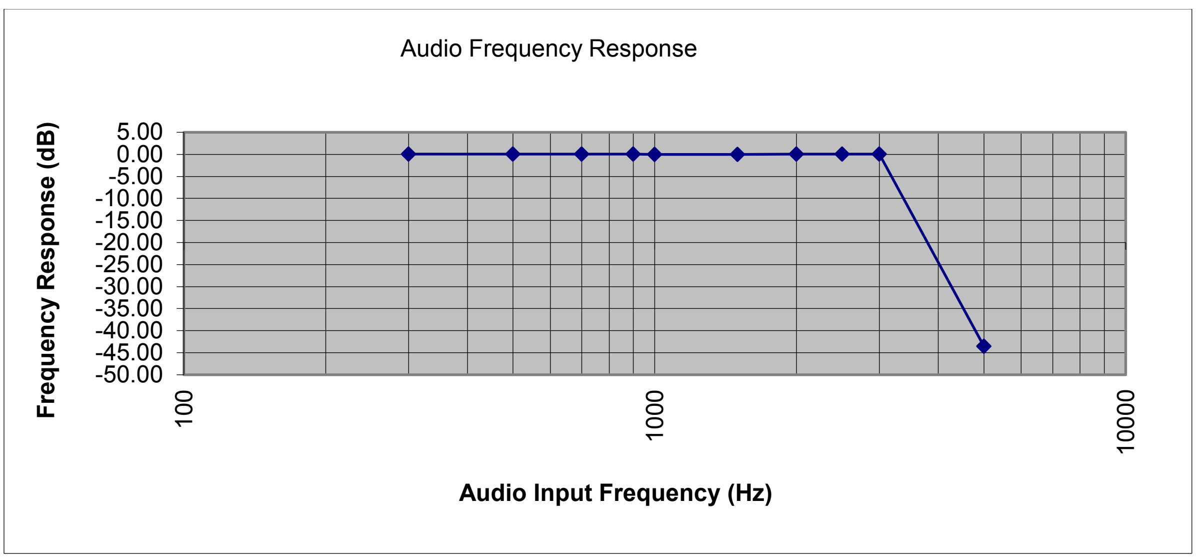
420 MHz - WB_ 25 kHz



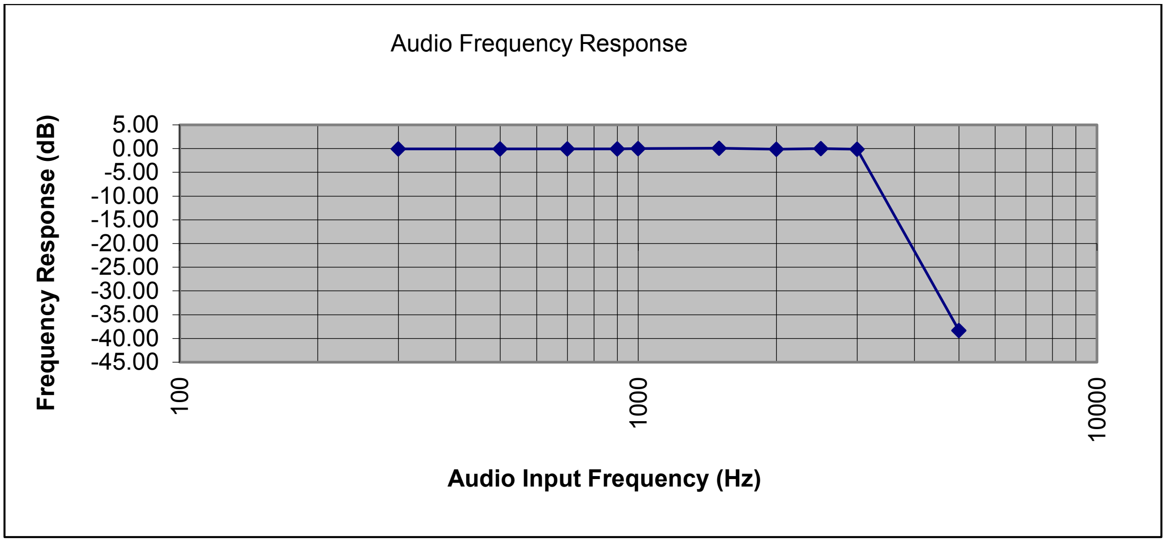
461 MHz – NB_12.5 kHz



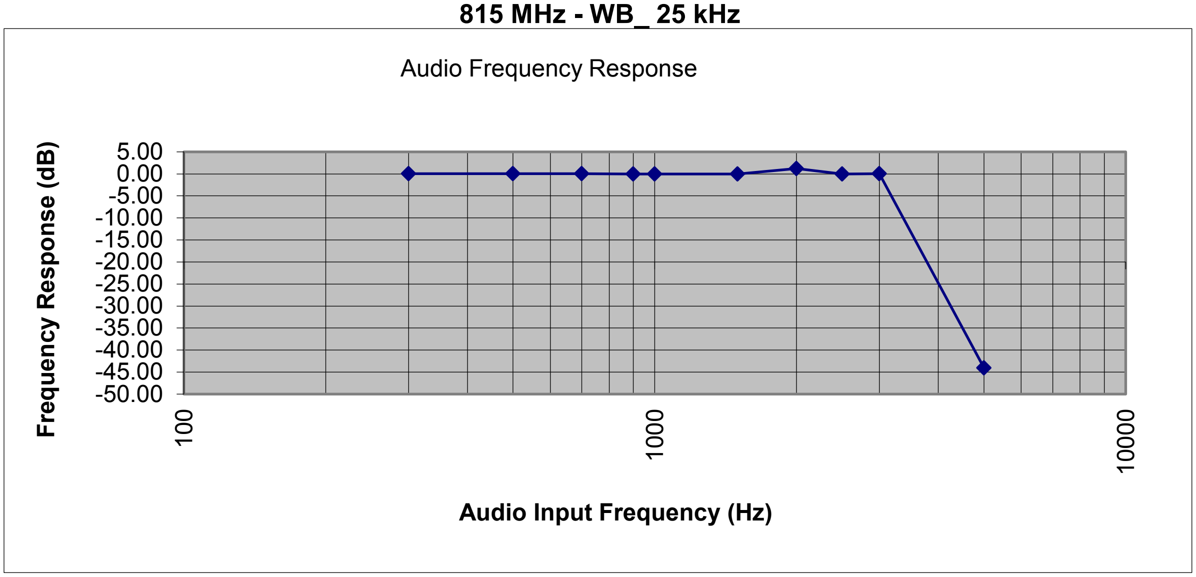
461 MHz - WB_ 25 kHz



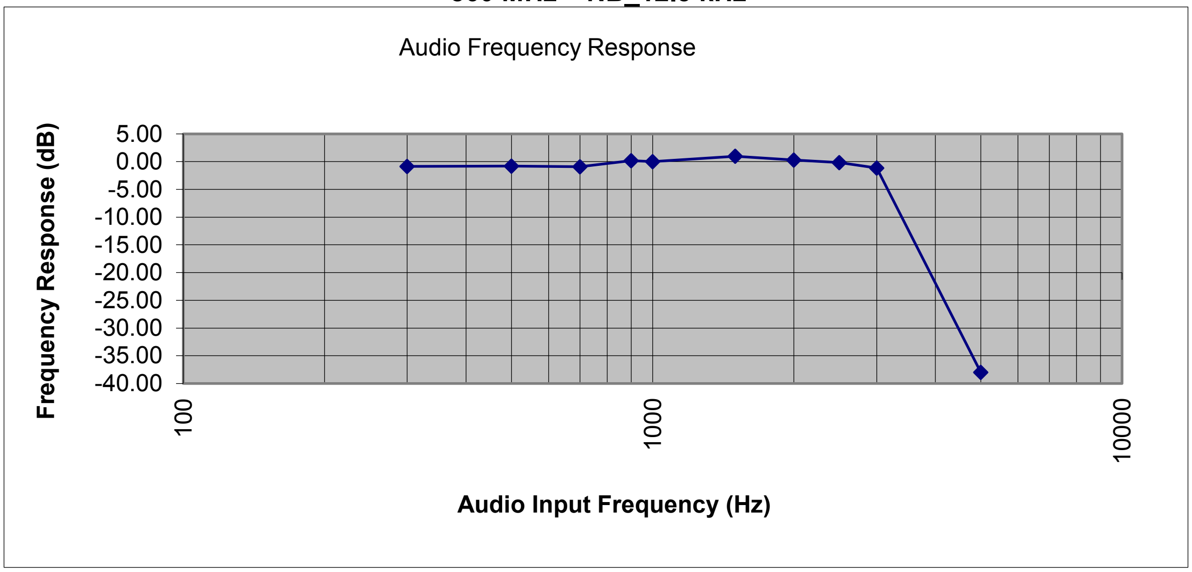
815 MHz – NB_12.5 kHz



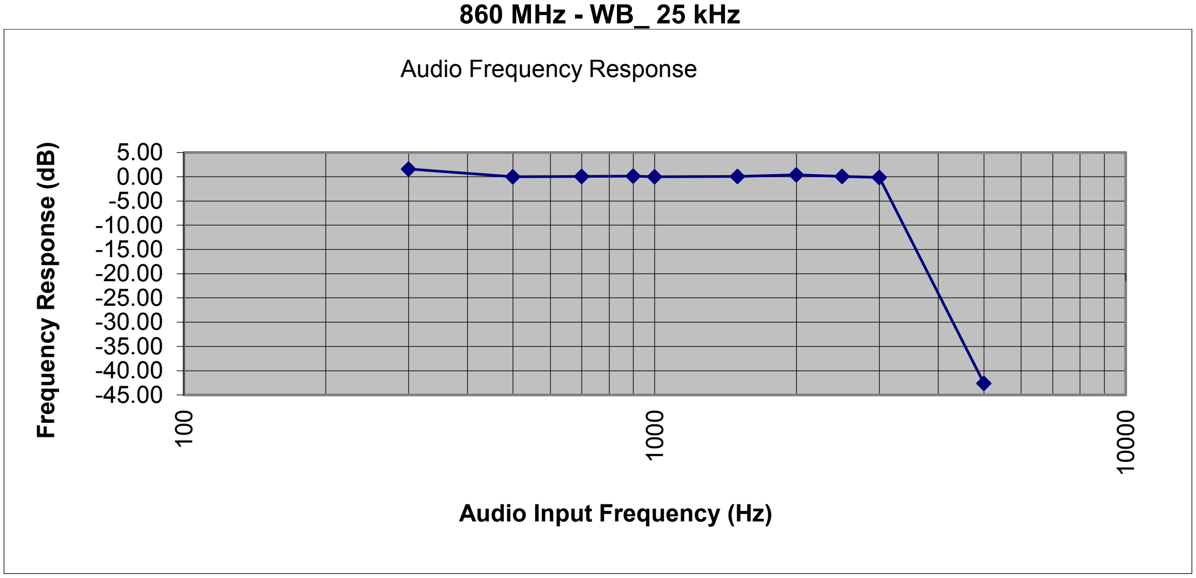
815 MHz - WB_ 25 kHz



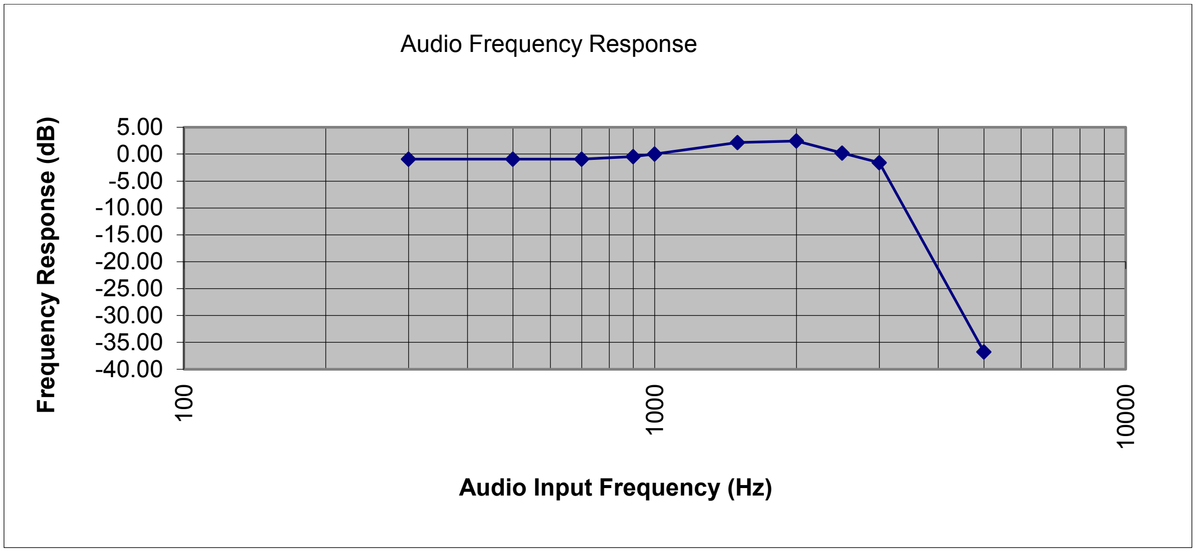
860 MHz – NB_12.5 kHz



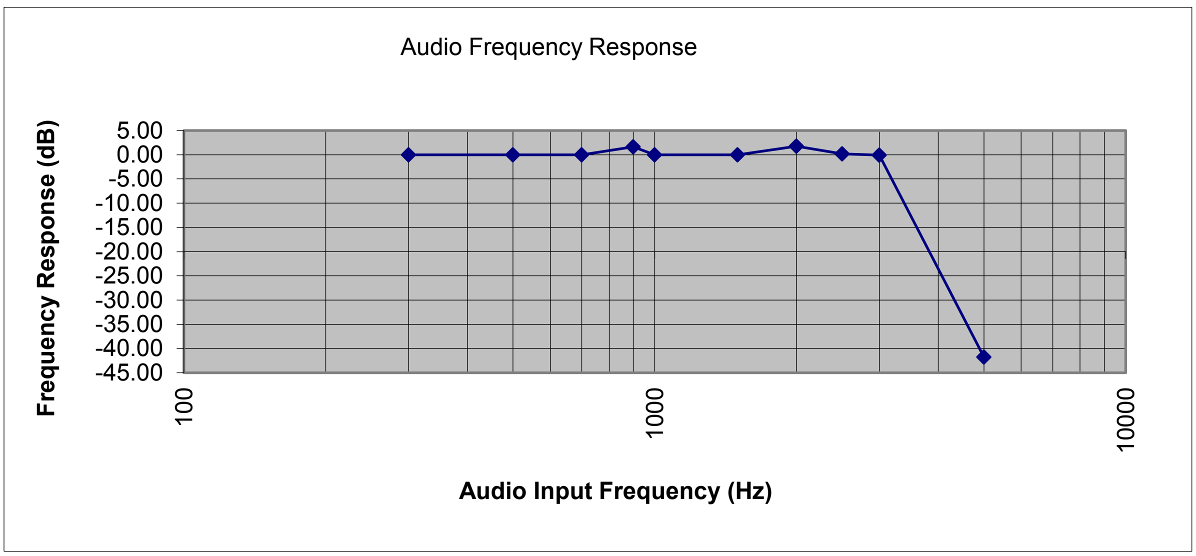
860 MHz - WB_ 25 kHz



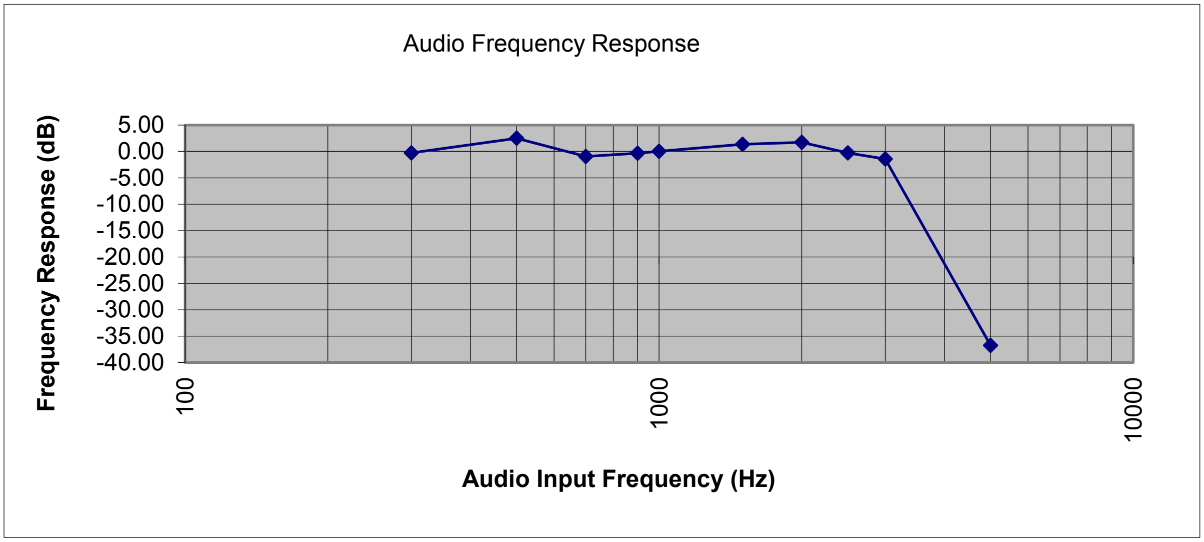
900.075 MHz – NB_12.5 kHz



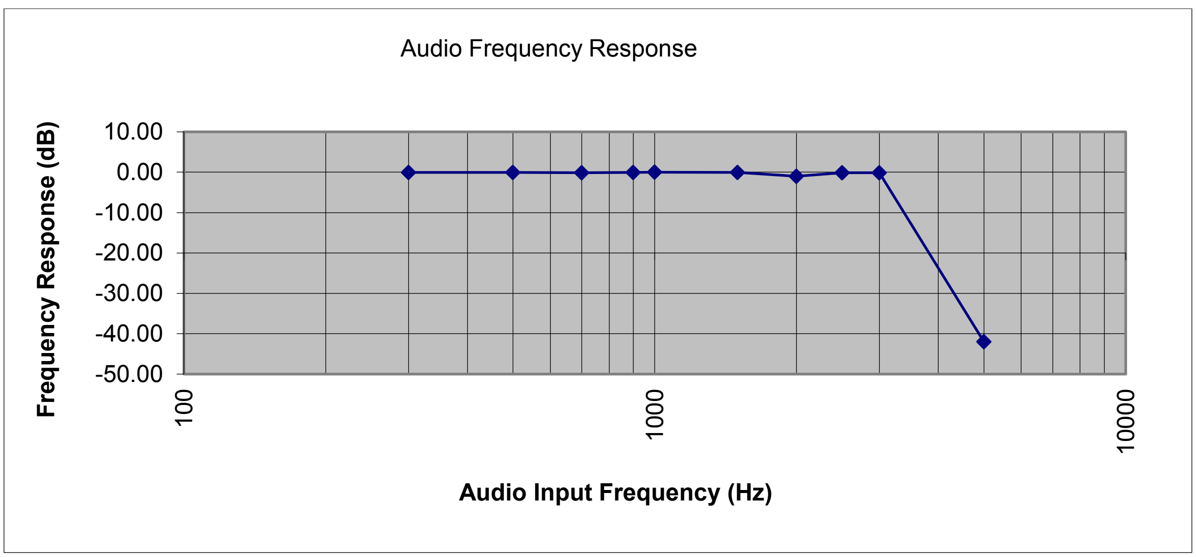
900.075 MHz - WB_ 25 kHz



939.075 MHz – NB_12.5 kHz



939.075 MHz - WB_ 25 kHz



Modulation Limiting

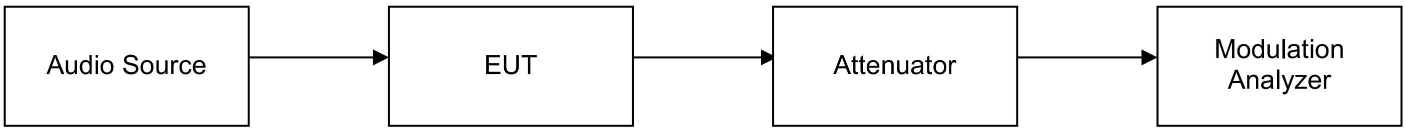
Engineer: Greg Corbin

Test Date:4/23/2019

Measurement Procedure

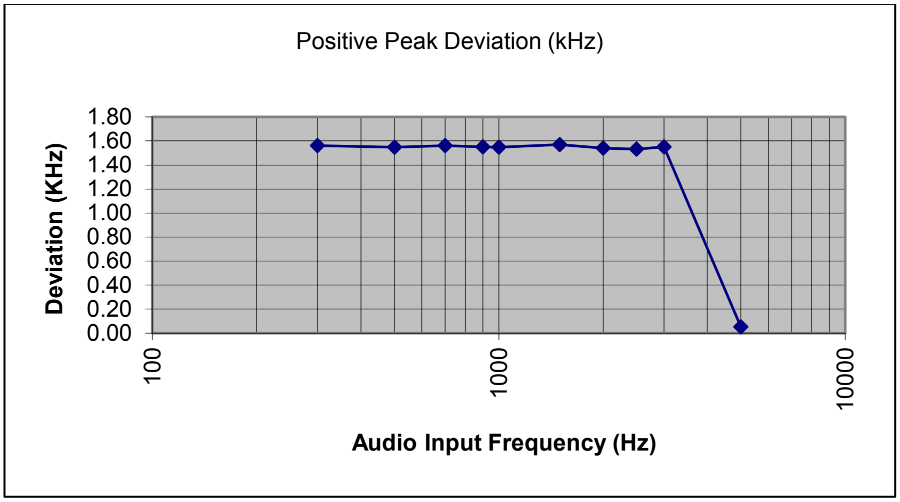
The EUT was connected directly to a modulation analyzer through an attenuator. The audio source was tuned across the required audio frequency range and the modulation limiting response was measured and plotted. The modulation analyzer is a real time spectrum analyzer with integrated demodulation, audio measurement capabilities, and timing analysis.

Test Setup

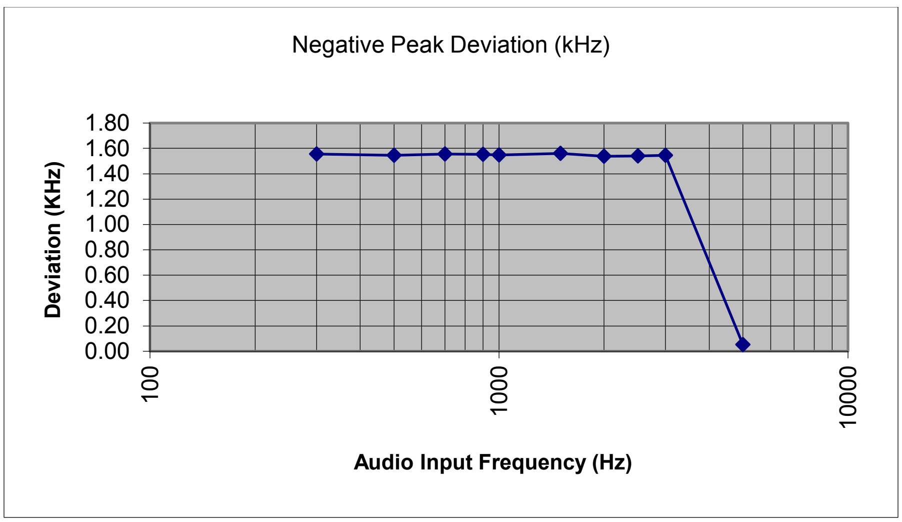


Modulation Limiting Test Results

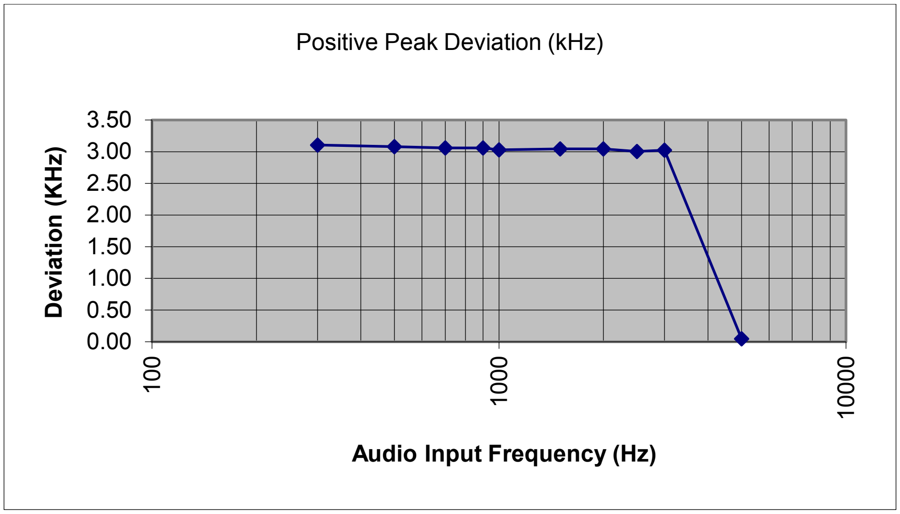
162 MHz – NB_12.5 kHz
Narrowband Positive Peaks



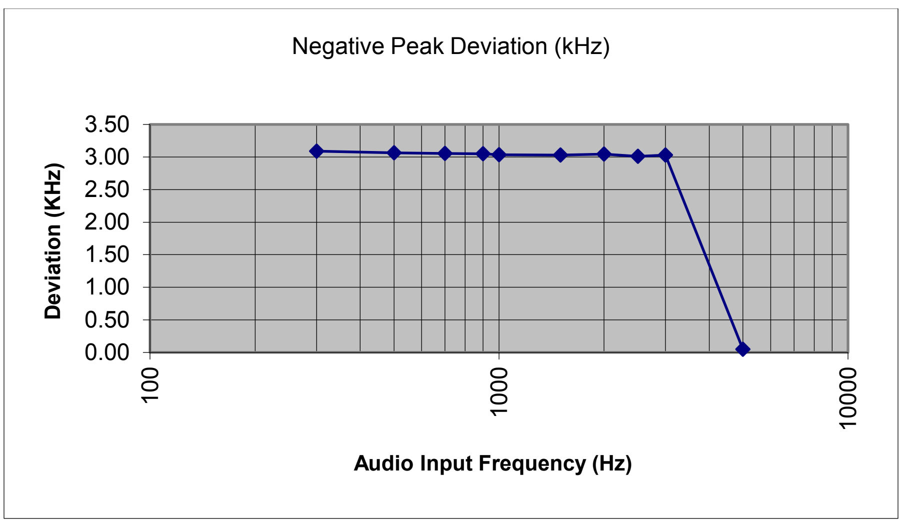
162 MHz – NB_12.5 kHz
Narrowband Negative Peaks



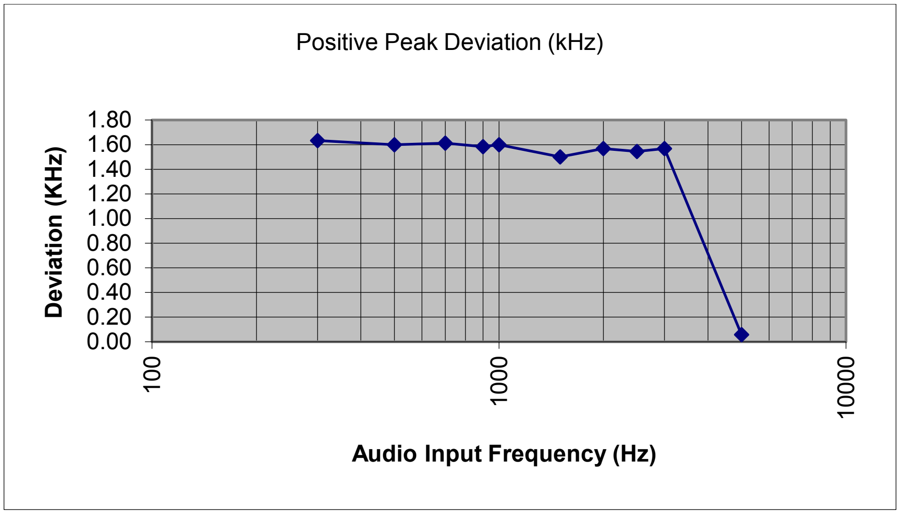
162 MHz - WB_ 25 kHz
Wideband Positive Peaks



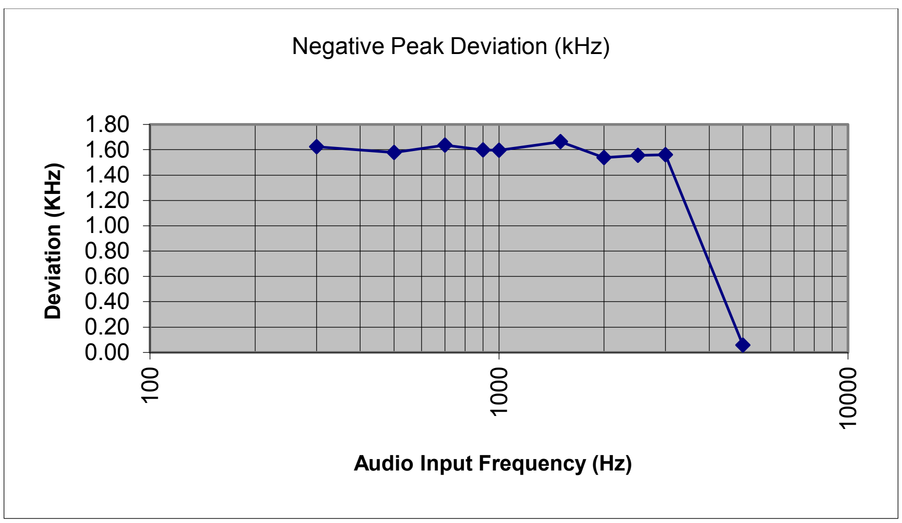
162 MHz - WB_ 25 kHz
Wideband Negative Peaks



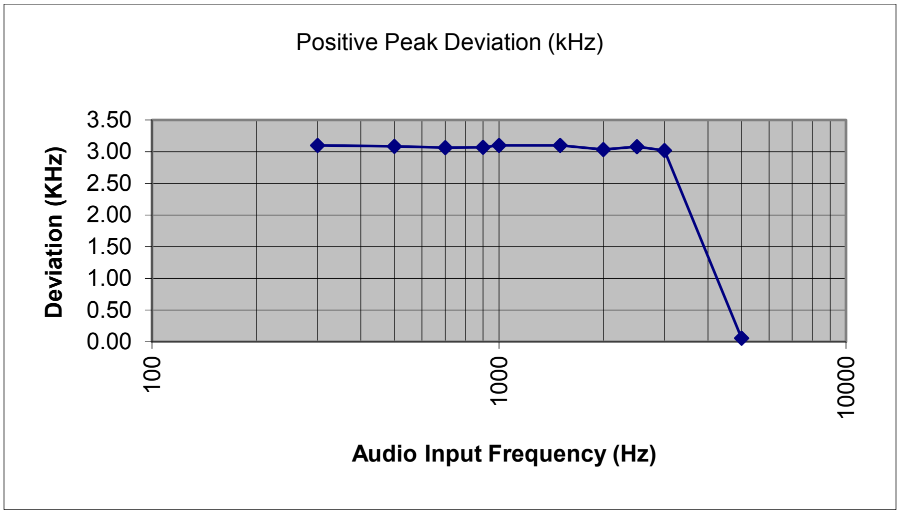
420 MHz – NB_12.5 kHz
Narrowband Positive Peaks



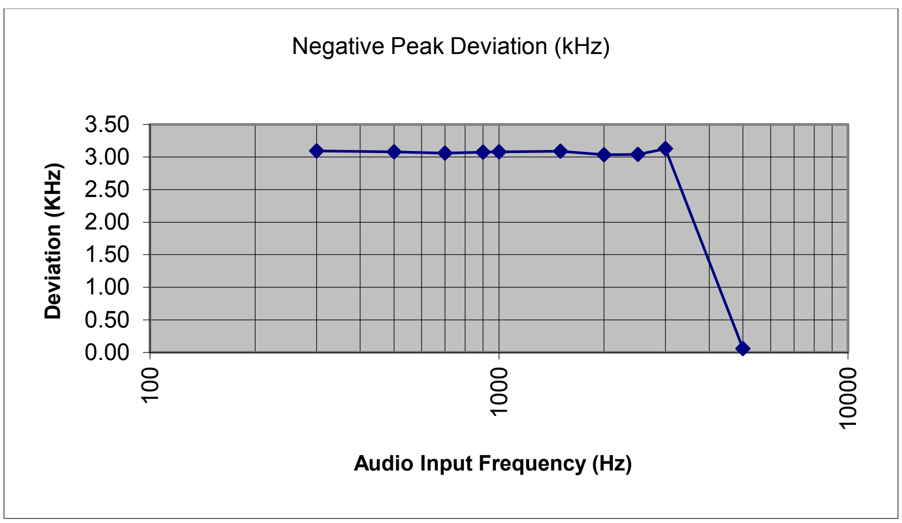
420 MHz – NB_12.5 kHz
Narrowband Negative Peaks



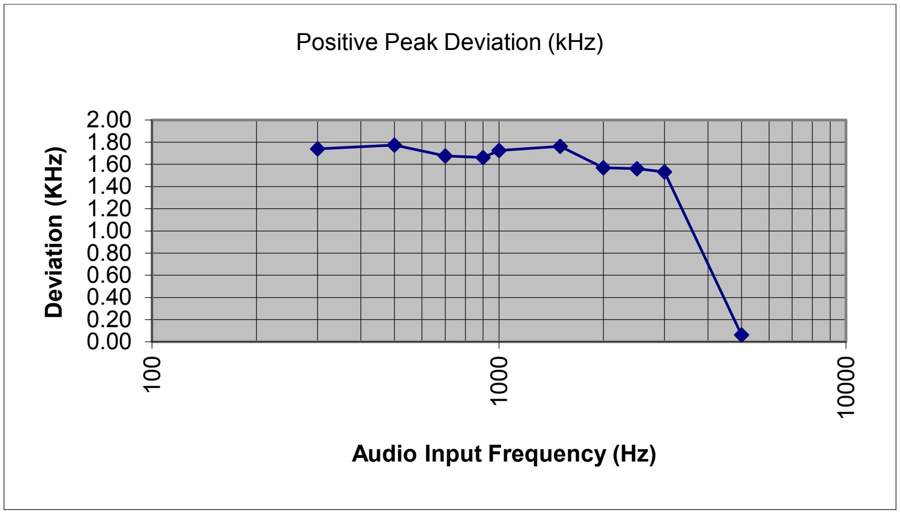
420 MHz - WB_ 25 kHz
Wideband Positive Peaks



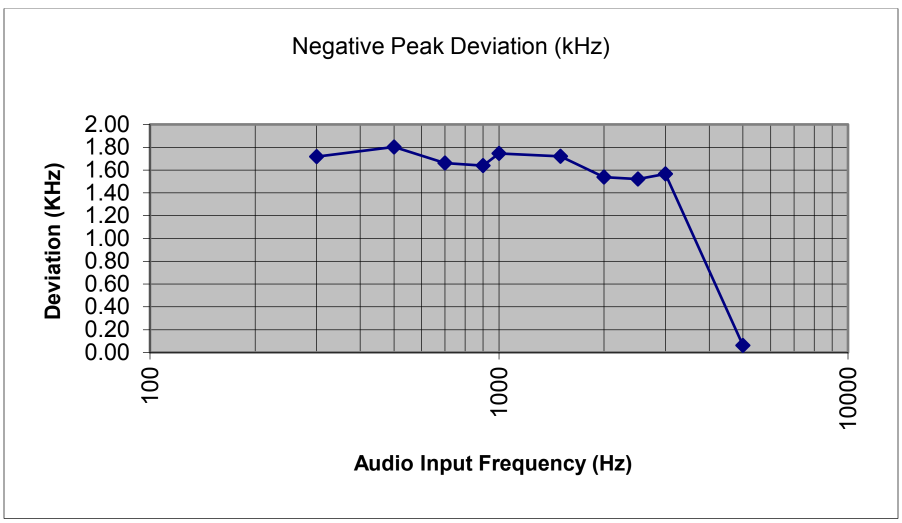
420 MHz - WB_ 25 kHz
Wideband Negative Peaks



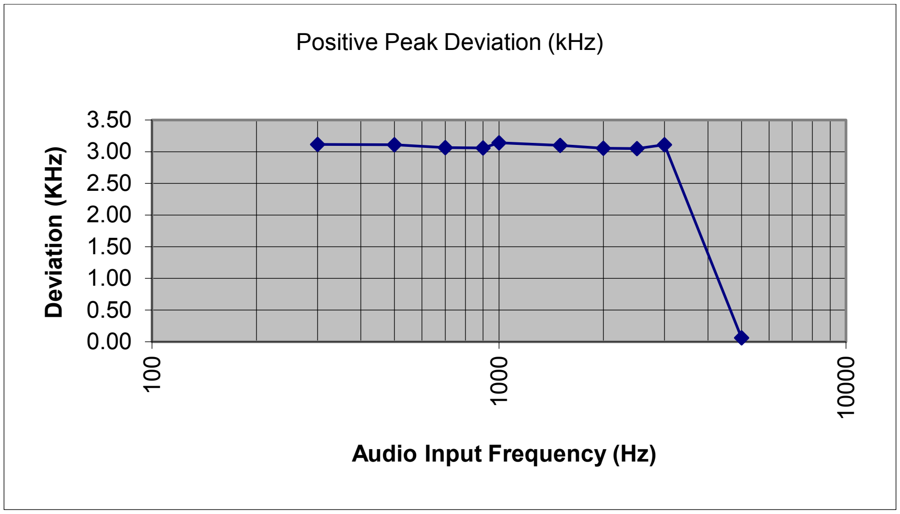
461 MHz – NB_12.5 kHz
Narrowband Positive Peaks



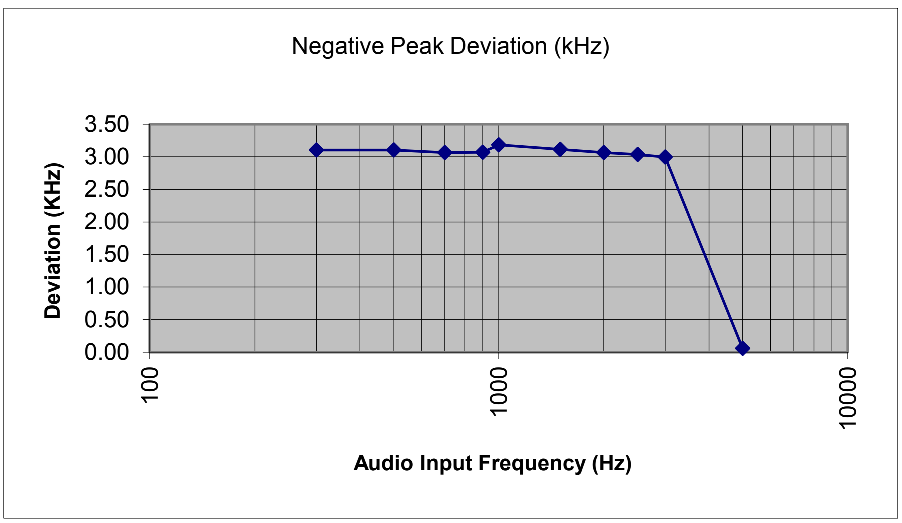
461 MHz – NB_12.5 kHz
Narrowband Negative Peaks



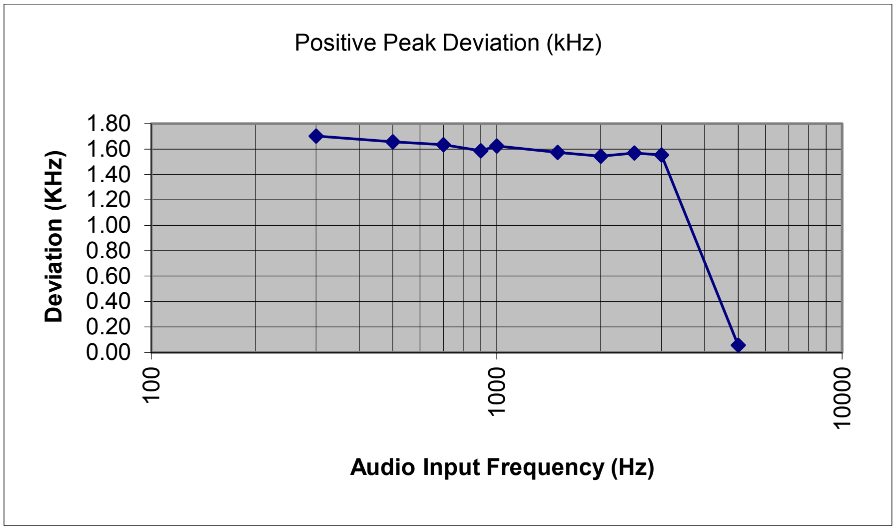
461 MHz - WB_ 25 kHz
Wideband Positive Peaks



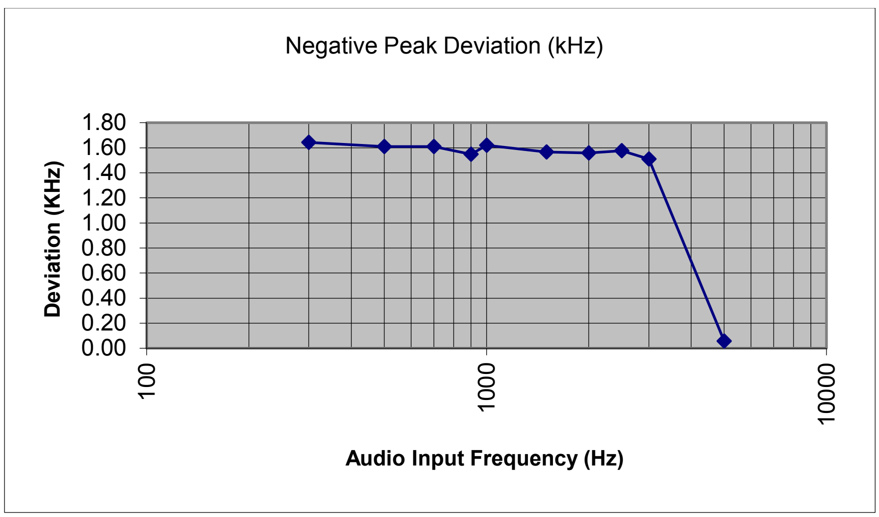
461 MHz - WB_ 25 kHz
Wideband Negative Peaks



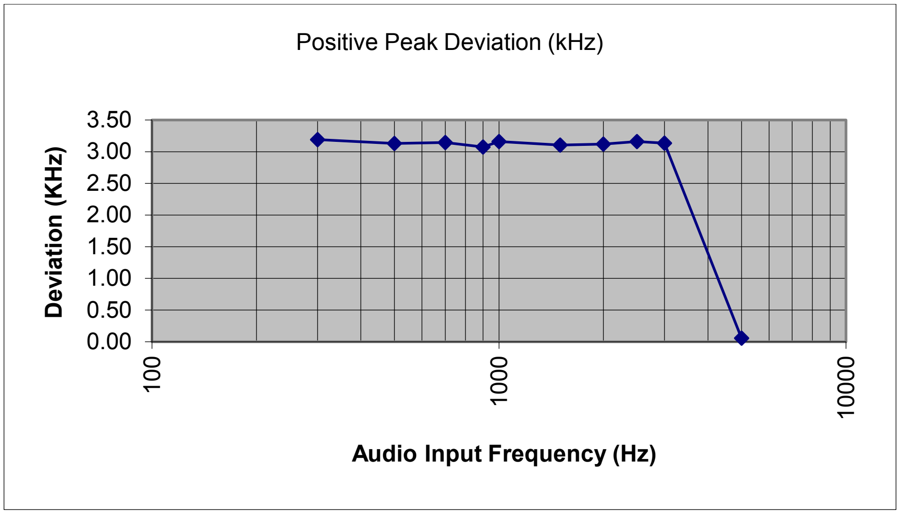
815 MHz – NB_12.5 kHz
Narrowband Positive Peaks



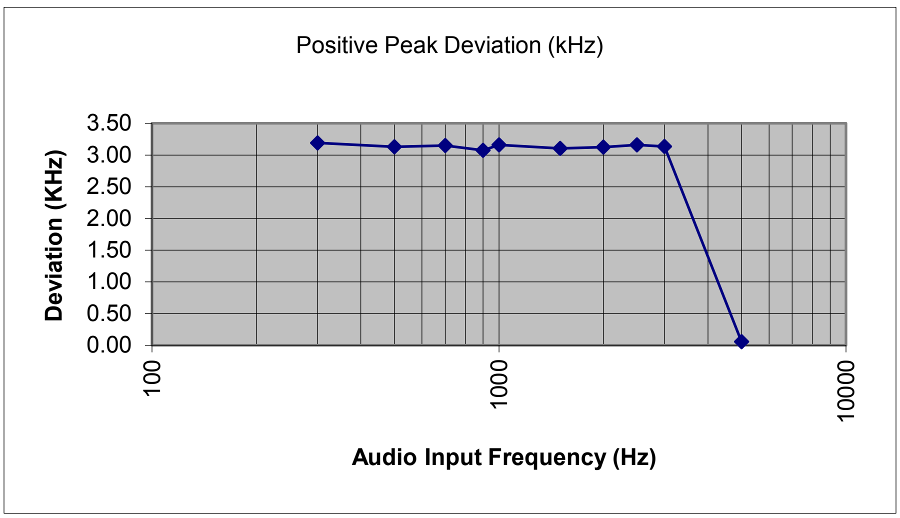
815 MHz – NB_12.5 kHz
Narrowband Negative Peaks



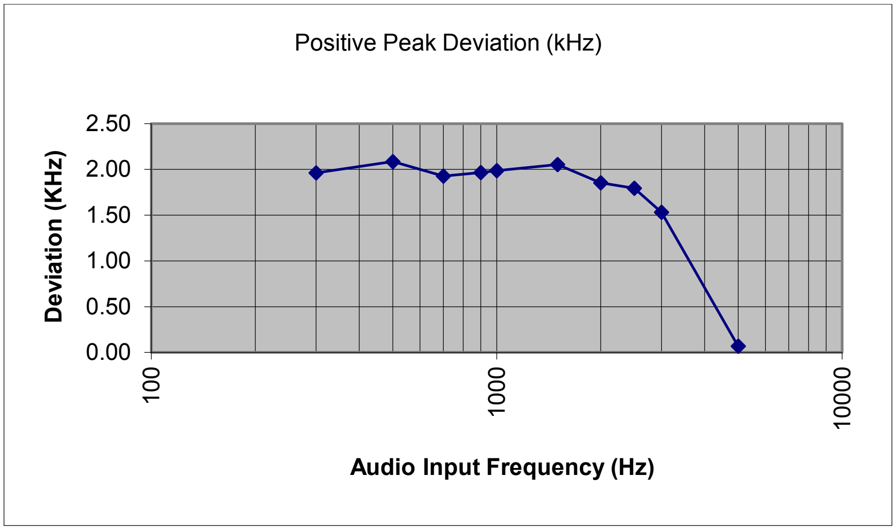
815 MHz - WB_ 25 kHz
Wideband Positive Peaks



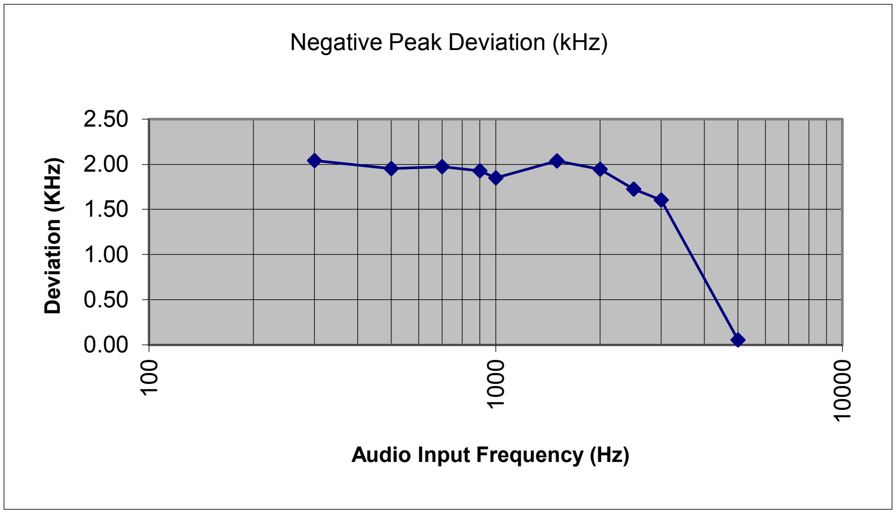
815 MHz - WB_ 25 kHz
Wideband Negative Peaks



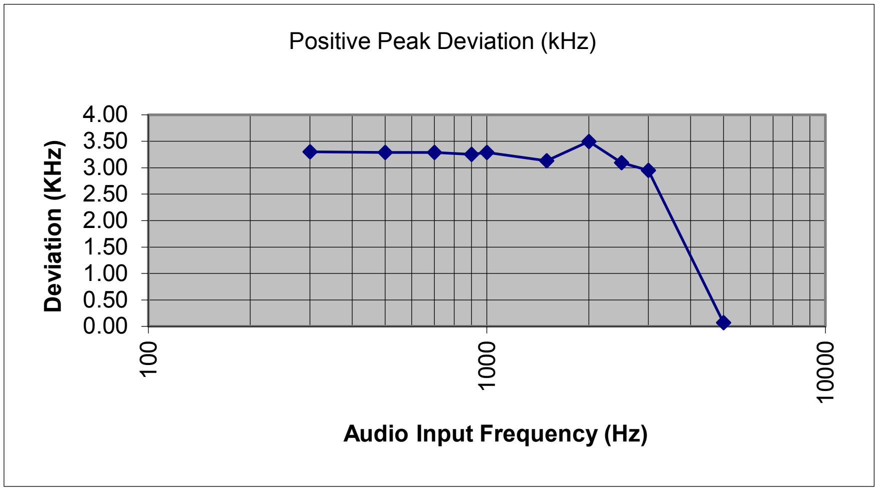
860 MHz – NB_12.5 kHz
Narrowband Positive Peaks



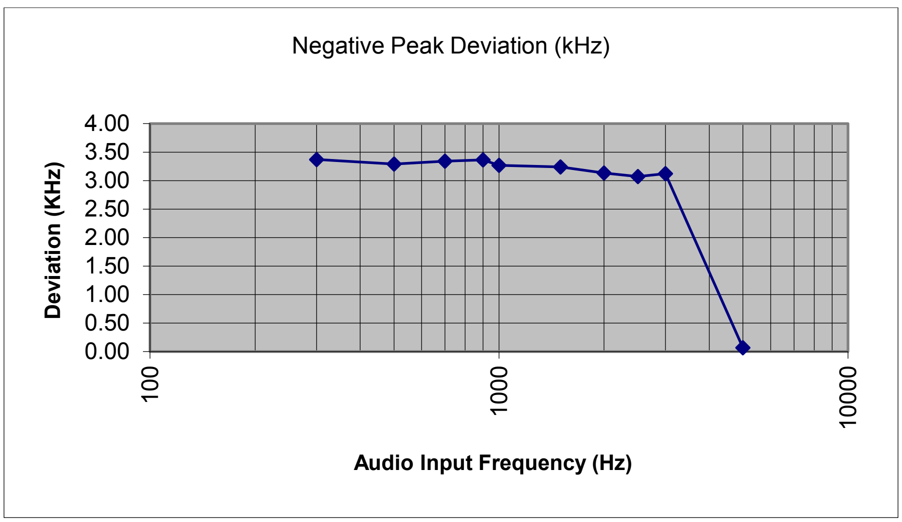
860 MHz – NB_12.5 kHz
Narrowband Negative Peaks



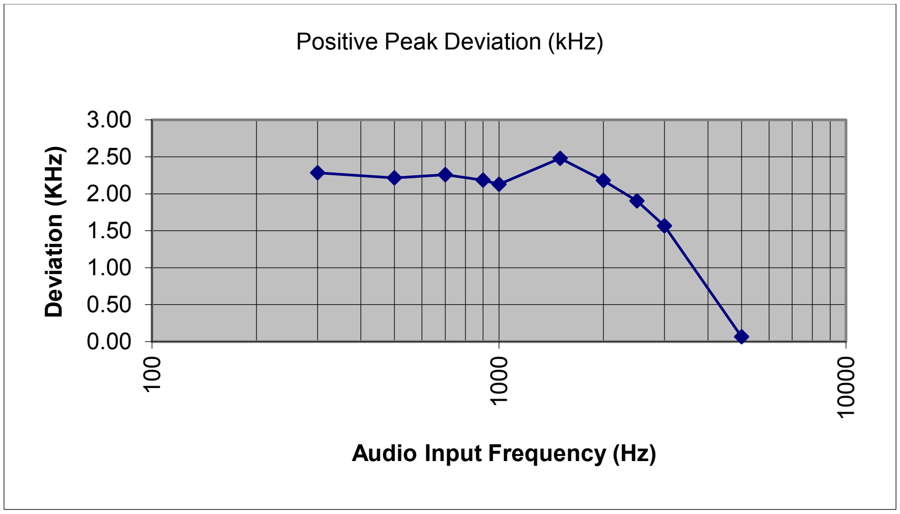
860 MHz - WB_ 25 kHz
Wideband Positive Peaks



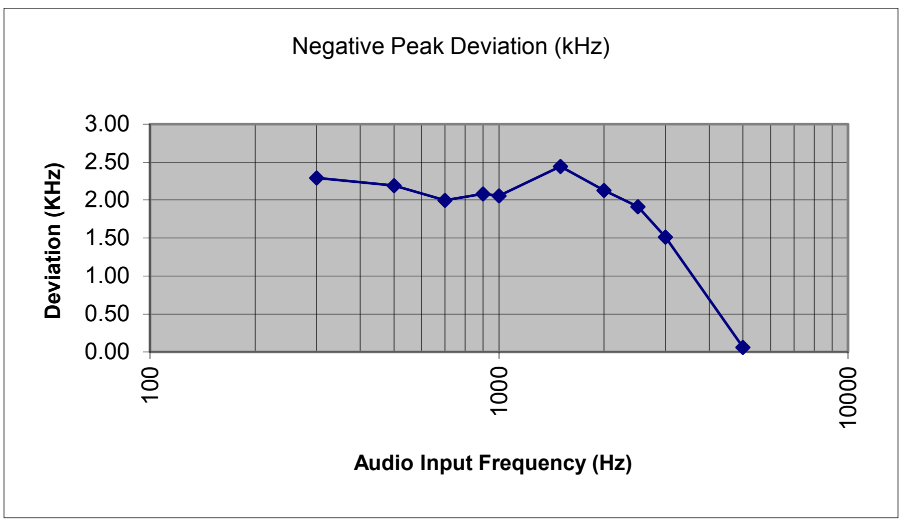
860 MHz - WB_ 25 kHz
Wideband Negative Peaks



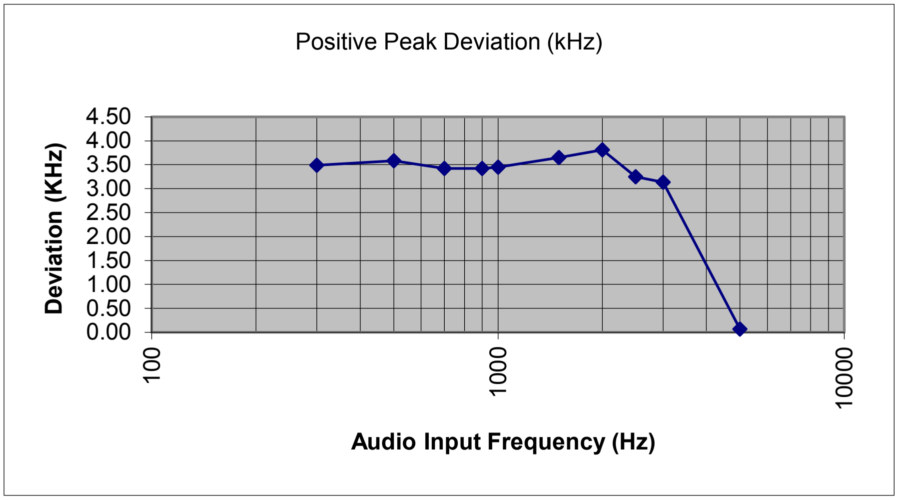
900.075 MHz – NB_12.5 kHz
Narrowband Positive Peaks



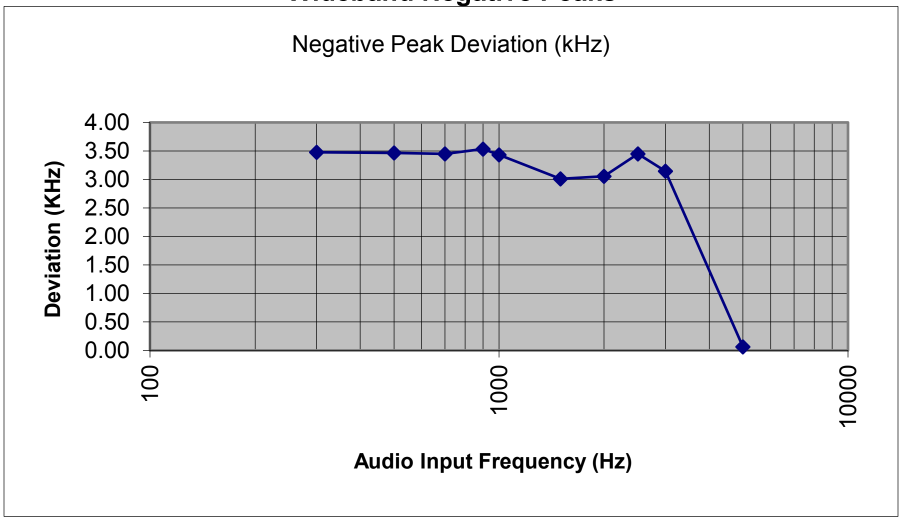
900.075 MHz – NB_12.5 kHz
Narrowband Negative Peaks



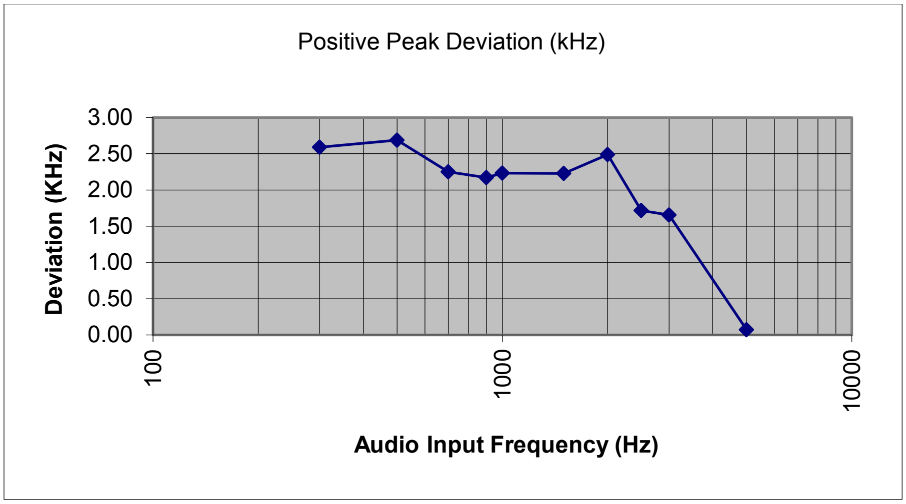
900.075 MHz - WB_ 25 kHz
Wideband Positive Peaks



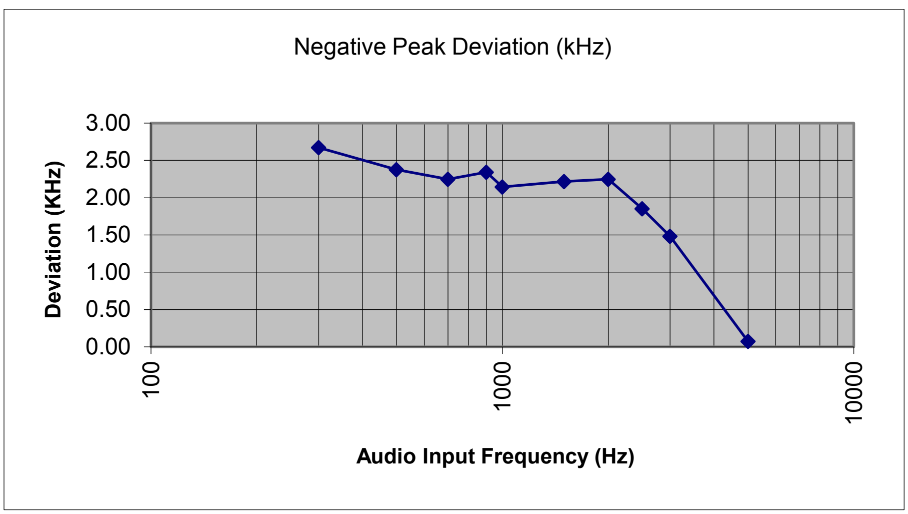
900.075 MHz - WB_ 25 kHz
Wideband Negative Peaks



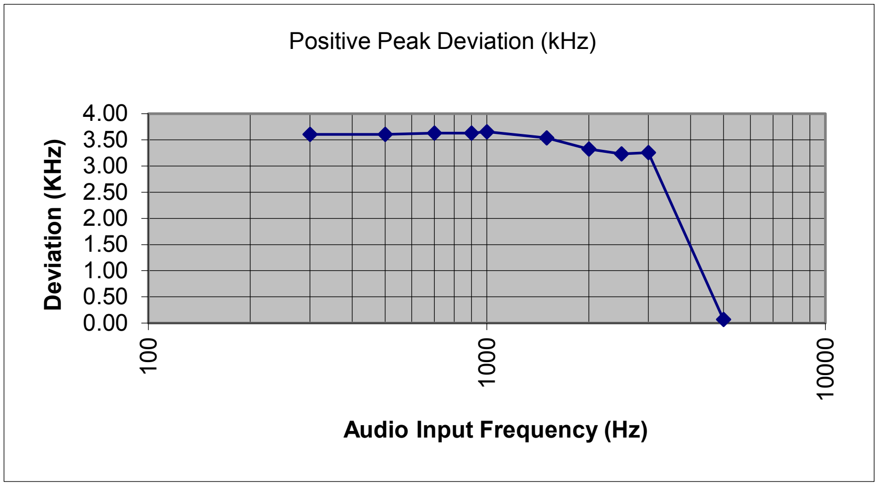
939.075 MHz – NB_12.5 kHz
Narrowband Positive Peaks



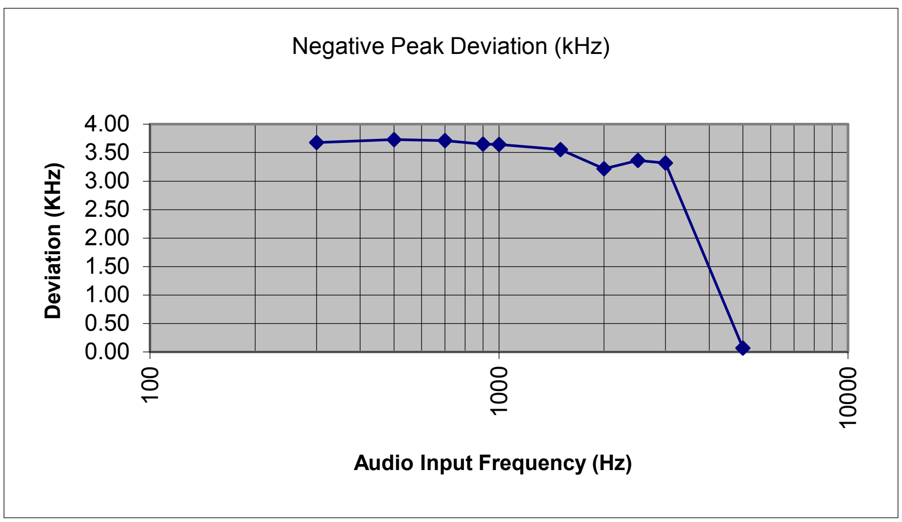
939.075 MHz – NB_12.5 kHz
Narrowband Negative Peaks



939.075 MHz - WB_ 25 kHz
Wideband Positive Peaks



939.075 MHz - WB_ 25 kHz
Wideband Negative Peaks

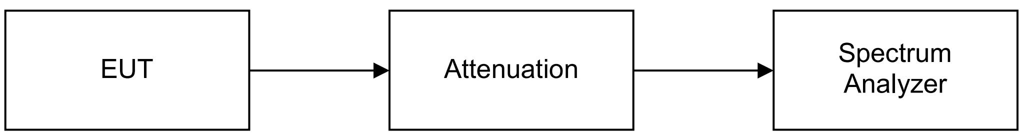


Frequency Stability (Temperature Variation)
Engineer: Greg Corbin
Test Date:4/21/2019

Measurement Procedure

The EUT was placed in an environmental test chamber and the RF output was connected directly to a spectrum analyzer.
The temperature was varied from -30°C to 50°C in 10°C increments.
After a sufficient time for temperature stabilization the RF output frequency was measured.
At 20°C the power supply voltage to the EUT was varied from 85% to 115% of the nominal value and the RF output was measured.
The temperature Stability was measured for each band (VHF, UHF, 800 MHz, 900 MHz) with the tuned frequency set close to the center frequency of the band

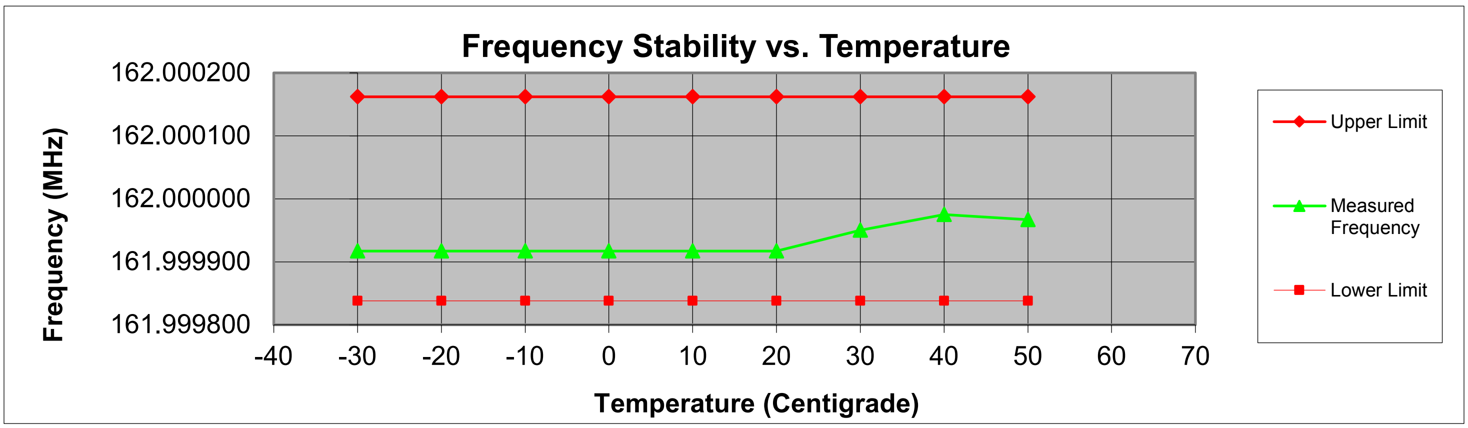
Measurement Setup



VHF Measurement Results

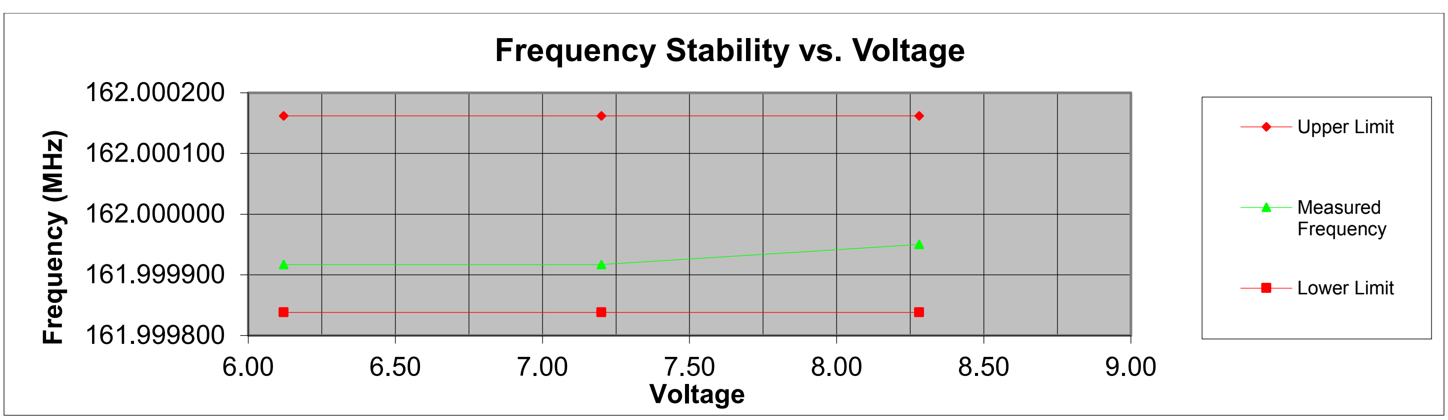
VHF Frequency Stability vs Temperature

Tuned Frequency	Temperature	Tolerance	Measured Frequency	Upper Limit	Lower Limit	Upper Margin	Lower Margin
(MHz)	(deg C)	(PPM)	(MHz)	(MHz)	(MHz)	(MHz)	(MHz)
162.000	-30	1	161.999917	162.000162	161.999838	-0.000245	0.000079
162.000	-20	1	161.999917	162.000162	161.999838	-0.000245	0.000079
162.000	-10	1	161.999917	162.000162	161.999838	-0.000245	0.000079
162.000	0	1	161.999917	162.000162	161.999838	-0.000245	0.000079
162.000	10	1	161.999917	162.000162	161.999838	-0.000245	0.000079
162.000	20	1	161.999917	162.000162	161.999838	-0.000245	0.000079
162.000	30	1	161.999950	162.000162	161.999838	-0.000212	0.000112
162.000	40	1	161.999975	162.000162	161.999838	-0.000187	0.000137
162.000	50	1	161.999967	162.000162	161.999838	-0.000195	0.000129



VHF Frequency Stability vs Voltage

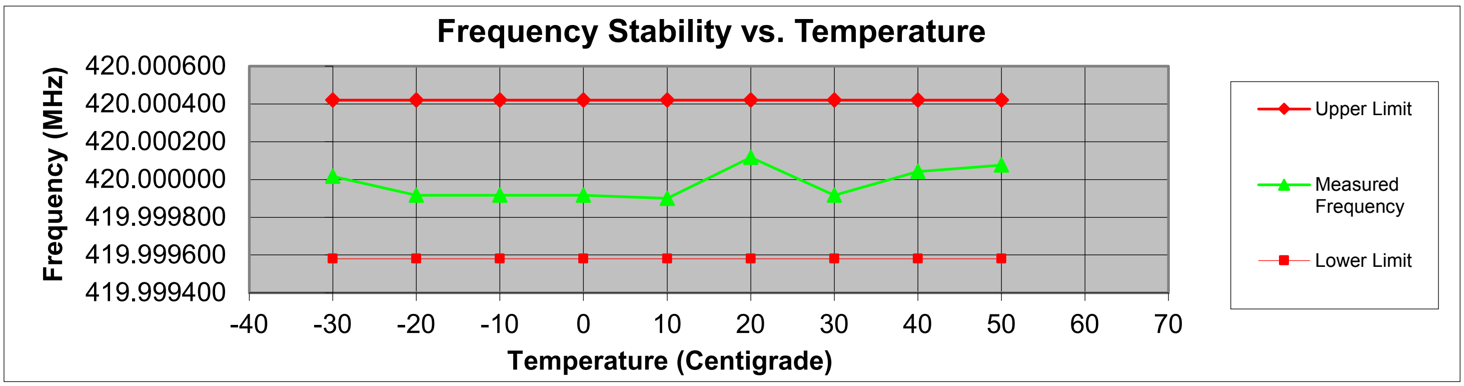
Tuned Frequency	Tolerance	Voltage	Measured Frequency	Upper Limit	Lower Limit	Upper Margin	Lower Margin
(MHz)	(PPM)	(PPM)	(MHz)	(MHz)	(MHz)	(MHz)	(MHz)
162.000	1	6.12	161.999917	162.000162	161.999838	-0.000245	0.000079
162.000	1	7.20	161.999917	162.000162	161.999838	-0.000245	0.000079
162.000	1	8.28	161.999950	162.000162	161.999838	-0.000212	0.000112



UHF Measurement Results

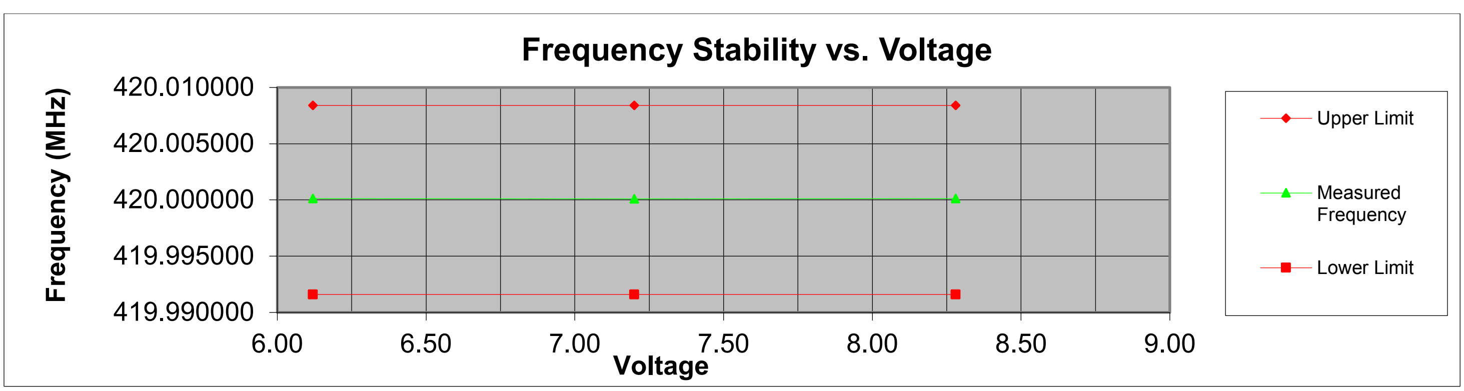
420 MHz_ Frequency Stability vs Temperature

Tuned Frequency	Temperature	Tolerance	Measured Frequency	Upper Limit	Lower Limit	Upper Margin	Lower Margin
(MHz)	(deg C)	(PPM)	(MHz)	(MHz)	(MHz)	(MHz)	(MHz)
420.000	-30	1	420.000017	420.000420	419.999580	-0.000403	0.000437
	-20	1	419.999917	420.000420	419.999580	-0.000503	0.000337
	-10	1	419.999917	420.000420	419.999580	-0.000503	0.000337
	0	1	419.999917	420.000420	419.999580	-0.000503	0.000337
	10	1	419.999900	420.000420	419.999580	-0.000520	0.000320
	20	1	420.000117	420.000420	419.999580	-0.000303	0.000537
	30	1	419.999917	420.000420	419.999580	-0.000503	0.000337
	40	1	420.000042	420.000420	419.999580	-0.000378	0.000462
	50	1	420.000075	420.000420	419.999580	-0.000345	0.000495



420 MHz Frequency Stability vs Voltage

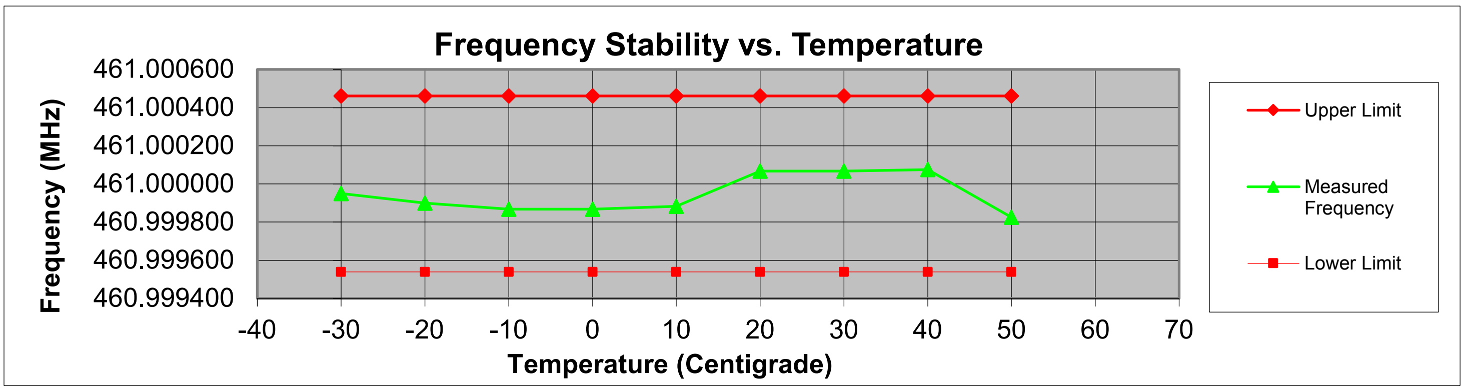
Tuned Frequency	Tolerance	Voltage	Measured Frequency	Upper Limit	Lower Limit	Upper Margin	Lower Margin
(MHz)	(PPM)	(PPM)	(MHz)	(MHz)	(MHz)	(MHz)	(MHz)
420.000	1	6.12	420.000117	420.008400	419.991600	-0.008283	0.008517
420.000	1	7.20	420.000100	420.008400	419.991600	-0.008300	0.008500
420.000	1	8.28	420.000117	420.008400	419.991600	-0.008283	0.008517



UHF Measurement Results

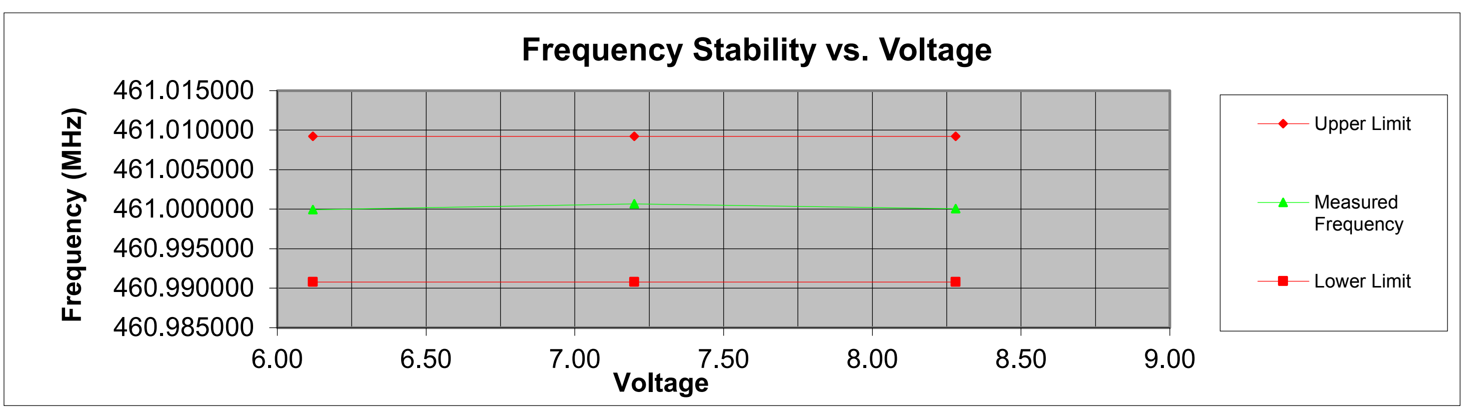
461 MHz_ Frequency Stability vs Temperature

Tuned Frequency (MHz)	Temperature (deg C)	Tolerance (PPM)	Measured Frequency (MHz)	Upper Limit (MHz)	Lower Limit (MHz)	Upper Margin (MHz)	Lower Margin (MHz)
461.000	-30	1	460.999950	461.000461	460.999539	-0.000511	0.000411
461.000	-20	1	460.999900	461.000461	460.999539	-0.000561	0.000361
461.000	-10	1	460.999867	461.000461	460.999539	-0.000594	0.000328
461.000	0	1	460.999867	461.000461	460.999539	-0.000594	0.000328
461.000	10	1	460.999883	461.000461	460.999539	-0.000578	0.000344
461.000	20	1	461.000067	461.000461	460.999539	-0.000394	0.000528
461.000	30	1	461.000067	461.000461	460.999539	-0.000394	0.000528
461.000	40	1	461.000075	461.000461	460.999539	-0.000386	0.000536
461.000	50	1	460.999825	461.000461	460.999539	-0.000636	0.000286



461 MHz Frequency Stability vs Voltage

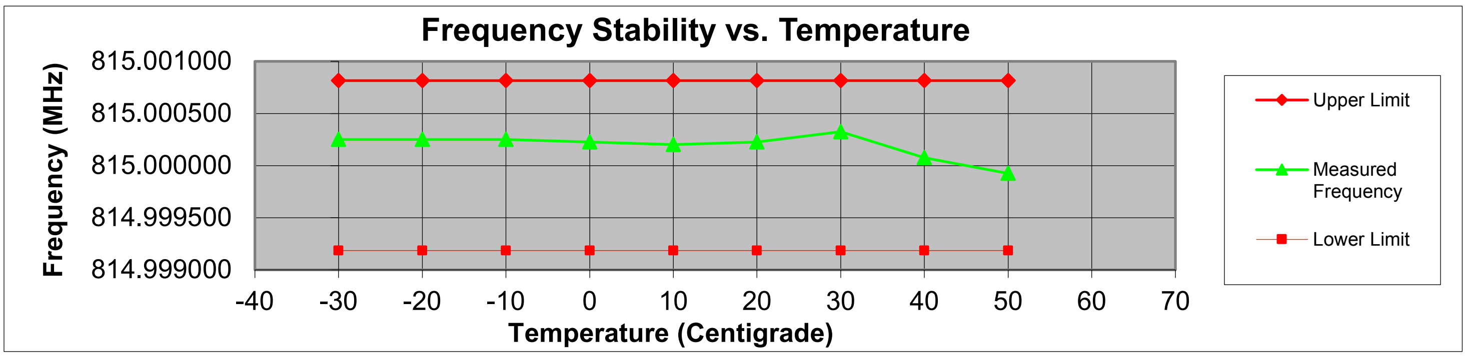
Tuned Frequency (MHz)	Tolerance (PPM)	Voltage (PPM)	Measured Frequency (MHz)	Upper Limit (MHz)	Lower Limit (MHz)	Upper Margin (MHz)	Lower Margin (MHz)
461.000	1	6.12					
461.000	1	7.20					
461.000	1	8.28					



800 MHz Band Measurement Results

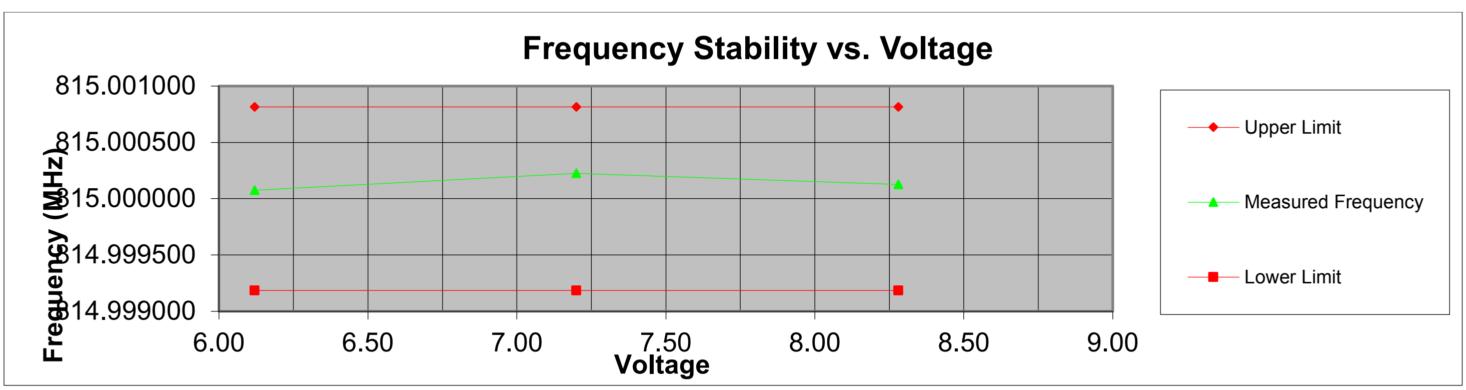
800 MHz Band Frequency Stability vs Temperature

Tuned Frequency (MHz)	Temperature (deg C)	Tolerance (PPM)	Measured Frequency (MHz)	Upper Limit (MHz)	Lower Limit (MHz)	Upper Margin (MHz)	Lower Margin (MHz)
815.000	-30	1	815.000250	815.000815	814.999185	-0.000565	0.001065
815.000	-20	1	815.000250	815.000815	814.999185	-0.000565	0.001065
815.000	-10	1	815.000250	815.000815	814.999185	-0.000565	0.001065
815.000	0	1	815.000225	815.000815	814.999185	-0.000590	0.001040
815.000	10	1	815.000200	815.000815	814.999185	-0.000615	0.001015
815.000	20	1	815.000225	815.000815	814.999185	-0.000590	0.001040
815.000	30	1	815.000325	815.000815	814.999185	-0.000490	0.001140
815.000	40	1	815.000075	815.000815	814.999185	-0.000740	0.000890
815.000	50	1	814.999925	815.000815	814.999185	-0.000890	0.000740



800 MHz Band Frequency Stability vs Voltage

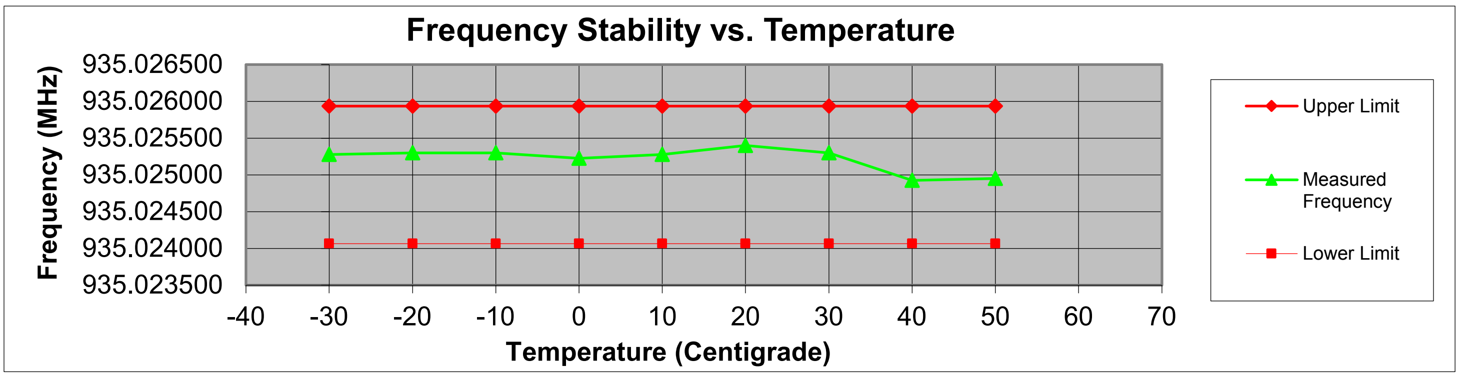
Tuned Frequency (MHz)	Tolerance (PPM)	Voltage (PPM)	Measured Frequency (MHz)	Upper Limit (MHz)	Lower Limit (MHz)	Upper Margin (MHz)	Lower Margin (MHz)
815.000	1	6.12	815.000075	815.000815	814.999185	-0.000740	0.000890
815.000	1	7.20	815.000225	815.000815	814.999185	-0.000590	0.001040
815.000	1	8.28	815.000125	815.000815	814.999185	-0.000690	0.000940



900 MHz Band Measurement Results

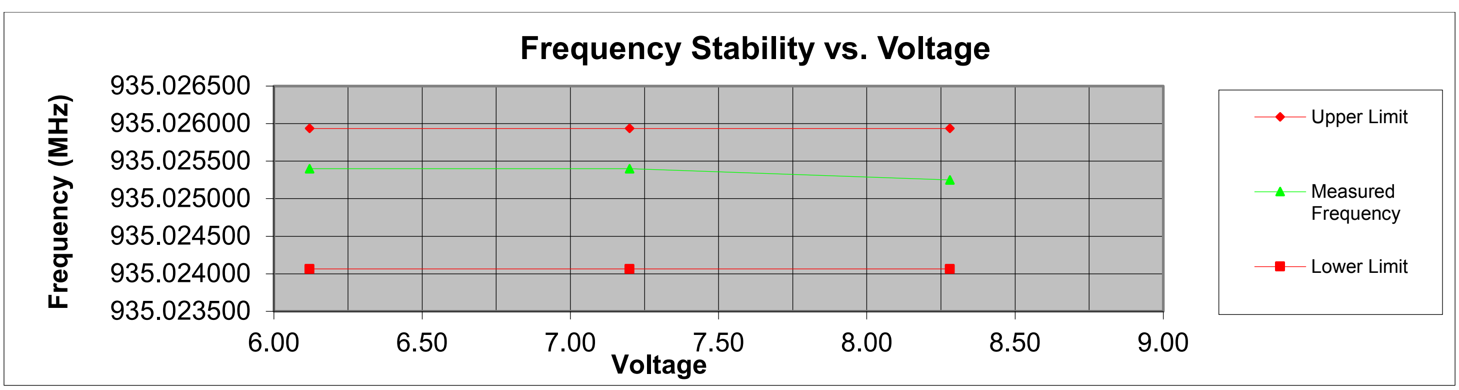
900 MHz Band Frequency Stability vs Temperature

Tuned Frequency (MHz)	Temperature (deg C)	Tolerance (PPM)	Measured Frequency (MHz)	Upper Limit (MHz)	Lower Limit (MHz)	Upper Margin (MHz)	Lower Margin (MHz)
935.025	-30	1	935.025275	935.025935	935.024065	-0.000660	0.001210
935.025	-20	1	935.025300	935.025935	935.024065	-0.000635	0.001235
935.025	-10	1	935.025300	935.025935	935.024065	-0.000635	0.001235
935.025	0	1	935.025225	935.025935	935.024065	-0.000710	0.001160
935.025	10	1	935.025275	935.025935	935.024065	-0.000660	0.001210
935.025	20	1	935.025400	935.025935	935.024065	-0.000535	0.001335
935.025	30	1	935.025300	935.025935	935.024065	-0.000635	0.001235
935.025	40	1	935.024925	935.025935	935.024065	-0.001010	0.000860
935.025	50	1	935.024950	935.025935	935.024065	-0.000985	0.000885



VHF Frequency Stability vs Voltage

Tuned Frequency (MHz)	Tolerance (PPM)	Voltage (PPM)	Measured Frequency (MHz)	Upper Limit (MHz)	Lower Limit (MHz)	Upper Margin (MHz)	Lower Margin (MHz)
935.025	1	6.12	935.025400	935.025935	935.024065	-0.000535	0.001335
935.025	1	7.20	935.025400	935.025935	935.024065	-0.000535	0.001335
935.025	1	8.28	935.025250	935.025935	935.024065	-0.000685	0.001185



Necessary Bandwidth Calculations
Engineer: Greg Corbin
Test Date: 6/24/2019

Modulation = 11K0F3E		
Necessary Bandwidth Calculation:		
Maximum Modulation (M), kHz	=	3
Maximum Deviation (D), kHz	=	2.5
Constant Factor (K)	=	1
Necessary Bandwidth (BN), kHz	=	(2xM)+(2xDxK)
	=	11.0

Modulation = 16K0F3E		
Necessary Bandwidth Calculation:		
Maximum Modulation (M) kHz	=	3
Maximum Deviation (D), kHz	=	5
Constant Factor (K)	=	1
Necessary Bandwidth (B_N), kHz	=	(2xM)+(2xDxK)
	=	16.0

Modulation = 8K10F1E		
Necessary Bandwidth Calculation:		
Maximum Modulation (M), kHz	=	1.55
Maximum Deviation (D), kHz	=	2.5
Constant Factor (K)	=	1
Necessary Bandwidth (B_N), kHz	=	(2xM)+(2xDxK)
	=	8.3

Modulation = 8K10F1D / 8K10F1W		
Necessary Bandwidth Calculation:		
Data Rate (R) Kbps	=	2.35
Maximum Deviation (D), kHz	=	2.5
Necessary Bandwidth (B_N), kHz	=	2.4D+1.0R
	=	8.3

Measurement Uncertainty

Measurement Uncertainty for Compliance Testing is listed in the table below.

The reported expanded uncertainty has been estimated at a 95% confidence level (k=2)

Measurement Type	Expanded Uncertainty
Conducted Emissions, AC Powerline	± 3.28 dB
Radiated Emissions_30 – 1000 MHz	± 4.82 dB
Radiated Emissions_1 – 18 GHz	± 5.73 dB
Frequency Error	± 22 Hz
Conducted RF Power	± 0.98 dB
Conducted Spurious Emission	± 2.49 dB
AC Voltage	± 2.3 %
DC Voltage	± 0.12 %
Temperature	± 1.0 deg C
Humidity	± 4.32 %

Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Bi-Log Antenna	Chase	CBL6111C	i00267	3/8/18	3/8/20
Horn Antenna	ARA	DRG-118/A	i00271	6/16/18	6/16/20
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	6/29/18	6/29/19
Temperature Chamber	Tenney	Tenney II Benchmaster	i00287	Verified on: 4/21/2019	
Spectrum Analyzer	Agilent	E4407B	i00331	12/4/18	12/4/19
Data Logger	Fluke	Hydra Data Bucket	i00343	5/15/19	5/15/20
EMI Analyzer	Agilent	E7405A	i00379	1/16/19	1/16/20
Spectrum Analyzer	Textronix	RSA5126A	i00424	5/9/18	5/9/19**
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	8/15/16	8/15/19
Signal Generator	Agilent	E4438C	i00457	10/15/18	10/15/19
Voltmeter	Fluke	179	i00488	4/24/19	4/24/20
Preamplifier	Miteq	AFS44 00101 400 23-10P-44	i00509	N/A	N/A

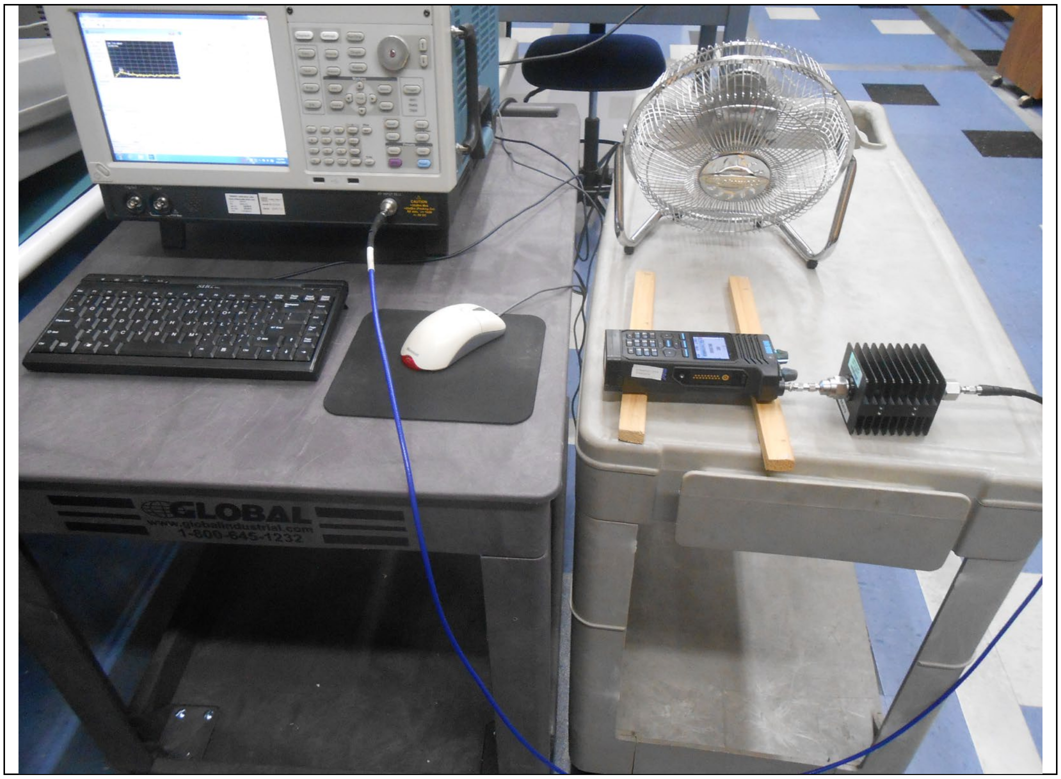
**60 day extension approved by QA manager

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT

Test Setup Photos
FCC ID: K95BKR9000
ISED ID: 2116A-BKR9000

RF Conducted #1



RF Conducted #2

RF Radiated #1

RF Radiated #2